GENERAL DESCRIPTION

NOTE: For information pertaining to the Fleetwood Eldorado radiator and grille, refer to the latter portion of this section.

Radiator

All 1969 Cadillac vehicles use a crossflow radiator as part of the engine closed cooling system. The radiator filler neck, vented pressure cap, and reservoir tube are located on top of the right tank. The radiator is constructed with two vertical tanks that connect to the enclosed crossflow tubing.

Grille

The 1969 Cadillac grille assembly Fig. 13-1 consists of a dual pattern of horizontal and vertical fins. Removal of the grille assembly may be accomplished without removing the front bumper.

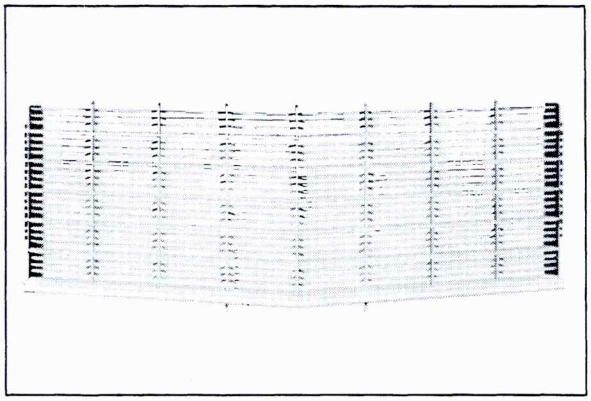


Fig. 13-1 Grille Assembly

SERVICE INFORMATION

1. Radiator Removal and Installation

a. Removal (Fig. 13-2)

1. Disconnect negative battery cable.
2. Open drain cock at bottom left corner of radiator. Remove radiator cap so coolant will flow freely.
3. Loosen hose clamps and disconnect upper and lower radiator hoses at radiator.
4. Loosen clamp and disconnect heater return hose at right radiator tank.
5. Disconnect two transmission cooler lines at transmission fluid cooler tank on right side of radiator. Plug all openings to prevent loss of fluid.
6. Remove upper hold-down brackets.
7. Remove reservoir hose from filler neck.
8. Being careful not to damage radiator with fan, remove radiator by lifting straight up.

b. Installation (Fig. 13-2)

1. Carefully lower radiator into position in cradle.
2. Install reservoir hose at filler neck.
3. Install upper hold-down brackets.
4. Connect two transmission cooler lines at transmission fluid cooler tank on right side of radiator.
5. Connect upper and lower radiator hoses at radiator and secure with hose clamps.
6. Connect heater return hose to right radiator tank.
7. Close radiator drain cock, and fill cooling system with recommended coolant, also add rust inhibitor and sealer.
8. Connect negative battery cable.
9. Set Automatic Climate Control to "ICE" position and rotate temperature dial to 85°. If car is equipped with heater only, set controls in maximum heat position.
10. Run engine sufficiently to pump coolant through entire system, and check radiator and transmission for fluid levels.
11. Install radiator cap and check all connections for leaks.

2. Grille Assembly Removal and Installation

a. Removal (Fig. 13-3)

1. Remove two screws holding center support rods to cradle tie bar.
2. Remove two screws holding center support rods to grille lower tabs.
3. Remove two screws from both sides of grille and remove grille.

b. Installation (Fig. 13-3)

1. Position grille and install two screws at both sides.
2. Install two screws and center support rods to grille lower tabs.
3. Install two screws holding center support rod to cradle tie bar.
4. Align grille and tighten all screws.

NOTE: Three radiator cradle mounts, Fig. 13-4, are used on all cars except the 693. The outer cradle mounts are affixed to adjustable frame-mounted brackets; therefore, no shims are required.

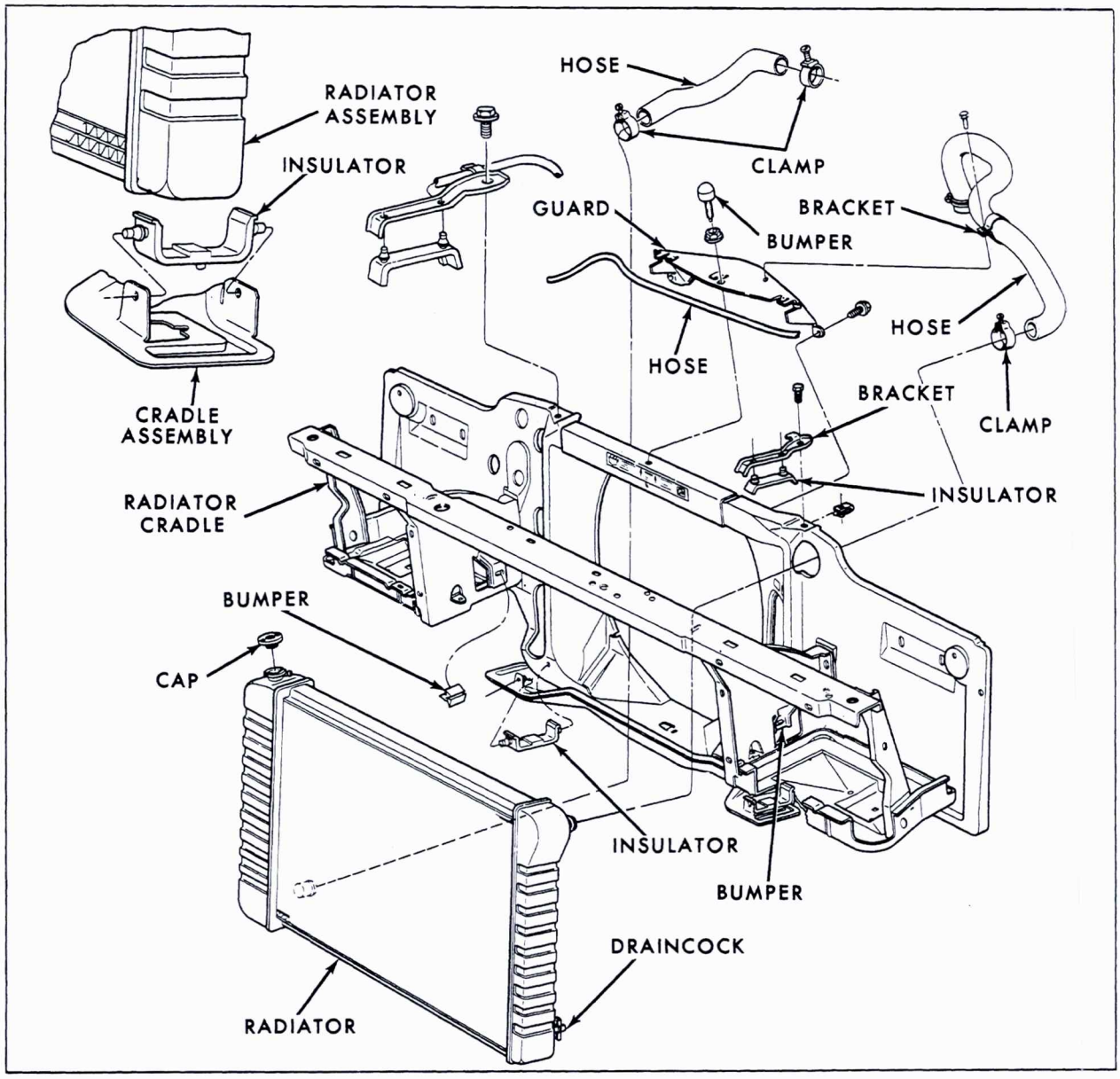


Fig. 13-2 Radiator and Cradle Assy.

The center cradle mount is non-adjustable and, may require shims. The actual number of shims used may vary with each installation. Use the quantity necessary to fill the gap remaining between the cradle and frame after the mounting pads are installed and the sheet metal aligned. The correct number of shims required may be determined by attempting to rotate the pad between the cradle and the frame. If the pad can be rotated with the fingers, add shims until pad can no longer be rotated.

TORQUE SPECIFICATIONS

Material Number	Application	Size	Torque
Steel	Transmission Oil Cooler Line Nut to Radiator Tank	5/8-18	40 ft. lbs.
1010	Fan Shroud to Radiator Support Bracket Screw	1/4-20	10 ft. lbs.
1010	Radiator Hose Clamps, Except at Water Pump	10-24	18 in. lbs.
1010	Radiator Hose Clamp at Water Pump	1/4-20	28 in. lbs.
NOTE: Refer to back of manual, Page 16-1, for bolt and nut markings, and steel classifications.			

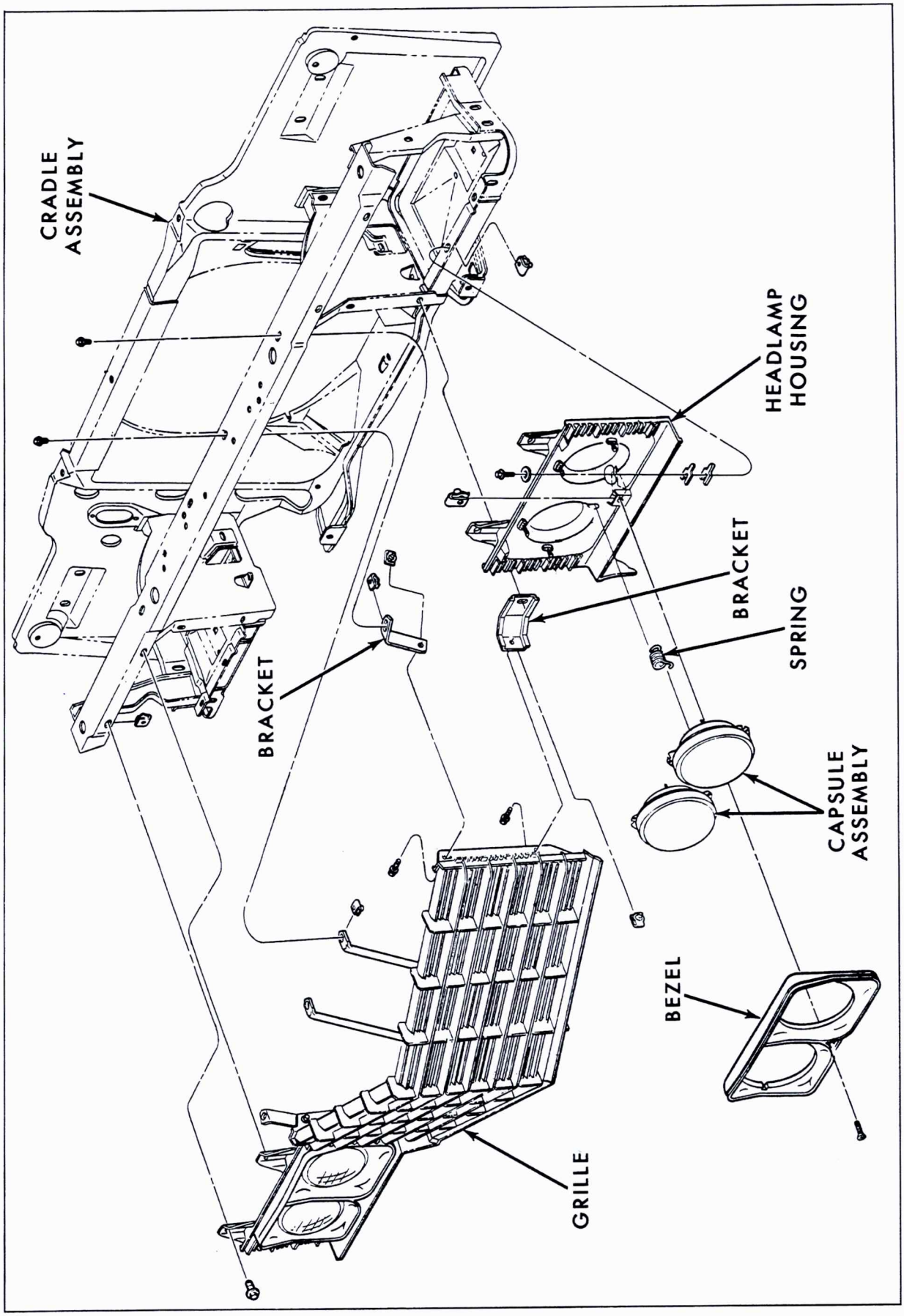
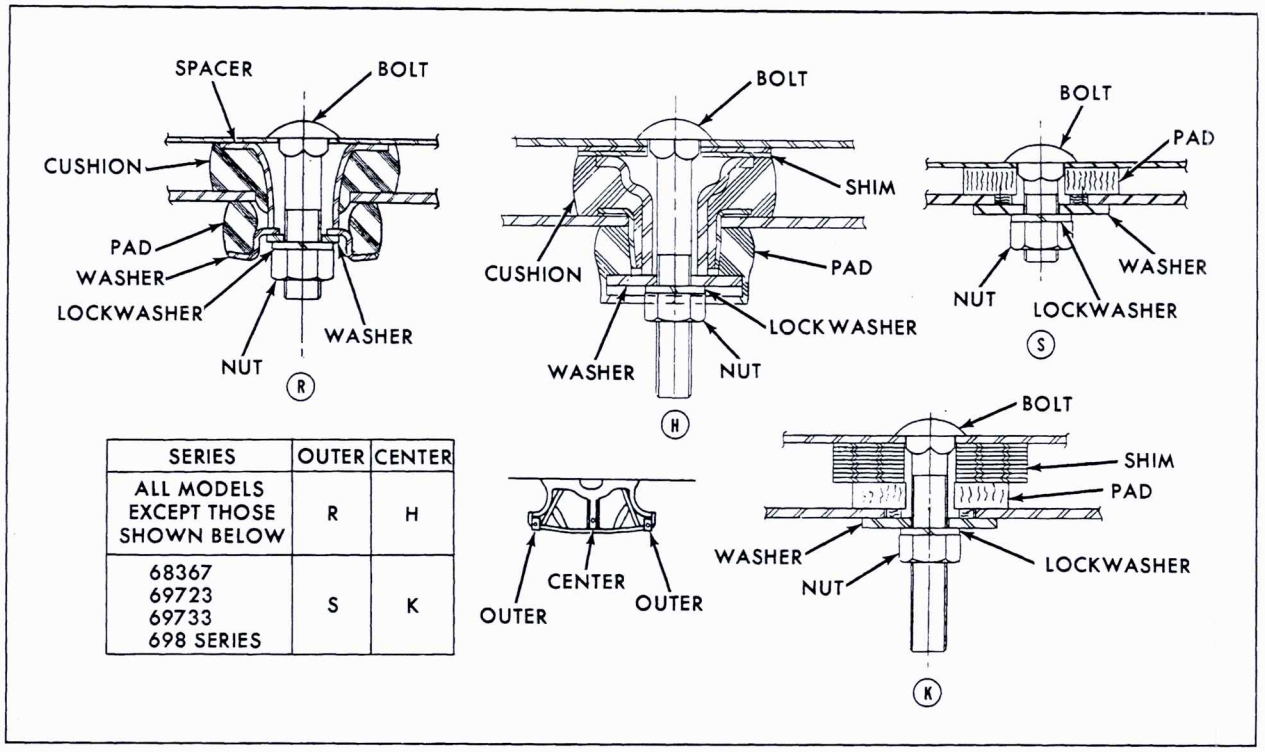


Fig. 13-3 Grille Disassembled



SERIES	OUTER	CENTER
ALL MODELS EXCEPT THOSE SHOWN BELOW	R	H
68367 69723 69733 698 SERIES	S	K

Fig. 13-4 Radiator Cradle Mounts (Except 693)

FLEETWOOD ELDORADO RADIATOR AND GRILLE

GENERAL DESCRIPTION

Radiator

The radiator used in the Fleetwood Eldorado is similar to the radiator used in all other 1969 Cadillac cars, utilizing the cross-flow principle, Fig. 13-6. All recommendations and cautions that apply to the radiator used on other 1969 Cadillac cars should also be exercised when servicing the Eldorado radiator.

Grille

The 1969 Fleetwood Eldorado upper and lower grilles, Fig. 13-5, consist of a pattern of vertical and horizontal bars projecting at the center.

The lower grille, Fig. 14-6, is a separate assembly installed into the front bumper.

3. Radiator Removal and Installation

a. Removal (Fig. 13-6)

1. Disconnect negative battery cable.
2. Open drain cock at bottom left corner of radiator. Remove radiator cap so coolant will flow freely.
3. Loosen hose clamps and disconnect upper and lower radiator hoses at radiator.
4. Loosen clamp and disconnect heater return hose at right radiator tank.
5. Disconnect two transmission cooler lines at transmission fluid cooler tank on right side of radiator. Plug all openings to prevent loss of fluid.
6. Remove three screws that hold finger guard to cradle and remove guard.
7. Remove two top radiator hold down brackets.

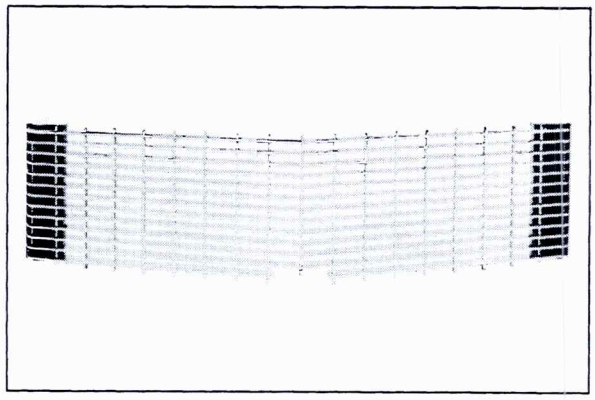


Fig. 13-5 Eldorado Grille Upper

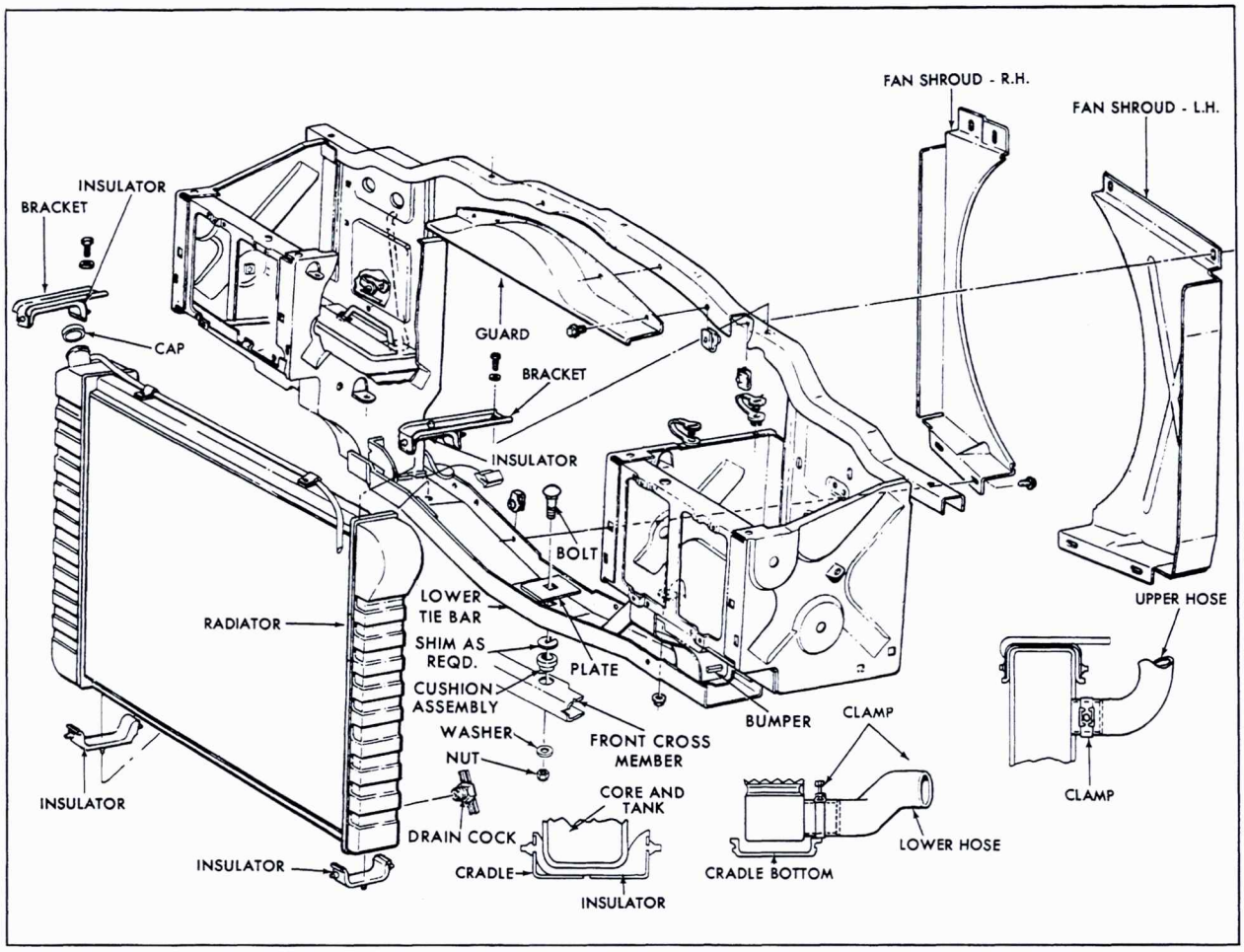


Fig. 13-6 Eldorado Radiator and Cradle Assy.

8. Remove reservoir hose from filler neck with two straps from top of radiator.

9. Being careful not to damage radiator with fan, remove radiator by lifting straight up.

b. Installation (Fig. 13-6)

1. Carefully lower radiator into position in cradle.

2. Connect reservoir hose to filler neck and install two straps at top of radiator.

3. Install two top radiator hold-down brackets. Tighten screws to 10 foot-pounds.

4. Connect two transmission cooler lines at transmission fluid cooler tank on right side of radiator.

5. Connect upper and lower radiator hoses at radiator and secure with hose clamps.

6. Connect heater return hose to right radiator tank.

7. Close radiator drain cock.

8. Install finger guard and secure with three screws. Tighten screws to 10 foot-pounds.

9. Fill cooling system with recommended coolant, also add rust inhibitor and sealer.

10. Connect negative battery cable.

11. Set Automatic Climate Control to "ICE" position and rotate temperature dial to 85°. If car is equipped with heater only, set controls in maximum heat position.

12. Run engine sufficiently to pump coolant through entire system and check radiator and transmission fluid levels.

13. Install radiator cap and check all connections for leaks.

NOTE: The center cradle support, Fig. 13-6, is new for 1969. It incorporates a compression type rubber mount for improved noise and vibration isolation. The number of shims required is determined by the proper alignment of the front sheet metal to the body shown in Fig. 11-10. After sheet metal alignment is achieved, attempt to rotate the pad between the cradle and the frame. If the pad can be rotated with the fingers, add shims until pad can no longer be rotated.

4. Grille Upper Assembly Removal and Installation

a. Removal (Fig. 13-7)

1. Remove two bolts, nuts and washers securing grille to mounting brackets at both sides.

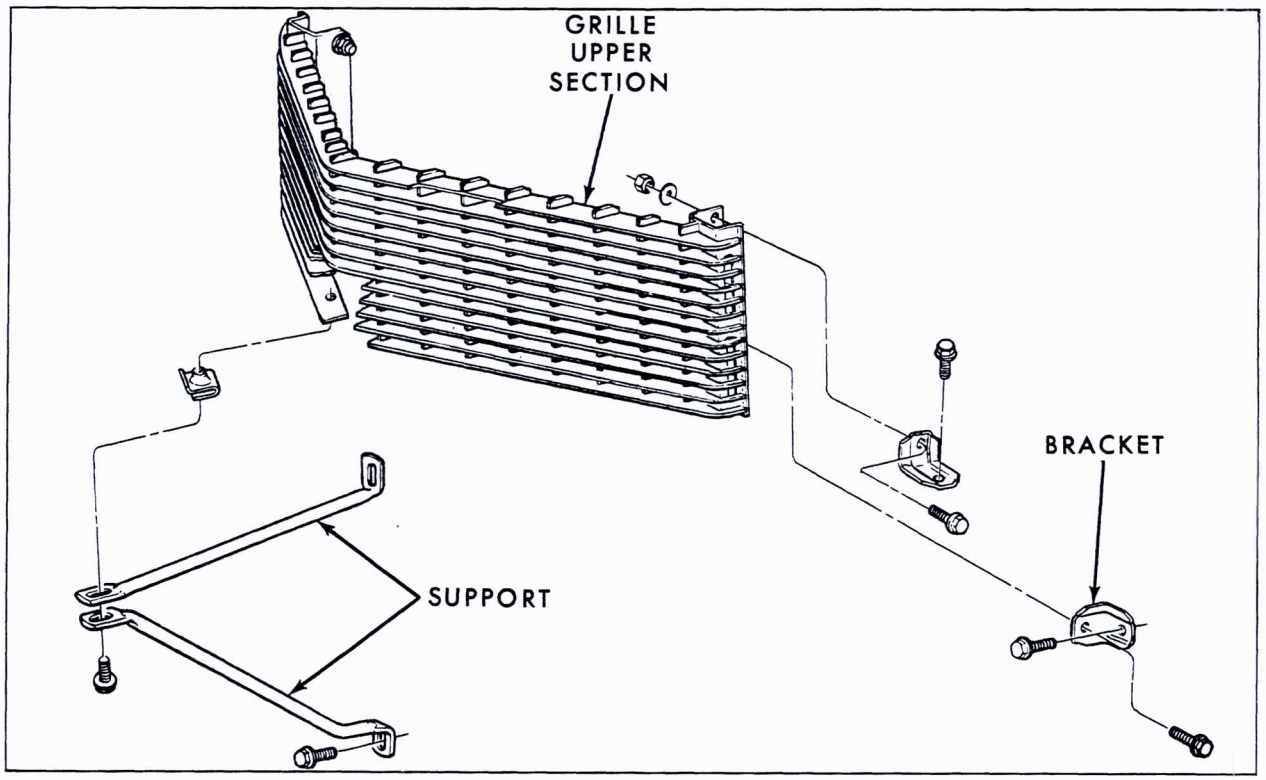


Fig. 13-7 Eldorado Grille - Disassembled

2. Remove screw securing grille to center support rods and remove grille.

b. Installation (Fig. 13-7)

1. Position grille and install screw securing grille to center support rods.
2. Install two bolts, nuts and washers both sides, securing grille to mounting brackets.

5. Grille Lower Assembly Removal and Installation

a. Removal (Fig. 14-6)

1. Remove nut securing radiator lower seal to bumper center support lower bolt and move seal back out of way.
2. Remove upper bolt and washer from bumper center support.
3. Loosen bumper center support lower nut and slide support rearward and remove.
4. Remove nut and bolt, both sides, securing lower grille mounting fins to angle brackets.
5. Facing front of car, slide grille rearward, shift to right, tilt left side down between bumper and radiator, lift right side up between cradle tie bar and upper grille and remove grille.

b. Installation (Fig. 14-6)

1. Facing front of car, tilt left side of grille down between upper grille and cradle tie bar, shift grille to right and position into bumper, notching center fin at license opening.
2. Install nut and bolt, both sides, securing lower grille mounting fins to angle brackets.
3. Slide bumper center support into lower, center bumper bar and tighten.
4. Install center support upper bolt and washer and tighten.
5. Install lower radiator seal over center support lower bolt and secure with nut.

TORQUE SPECIFICATIONS (693 Only)

Material Number	Application	Size	Torque
Steel	Transmission Oil Cooler Line Nut to Radiator Tank	5/8-18	40 ft. lbs.
1010	Fan Shroud to Radiator Support Bracket Screw	1/4-20	10 ft. lbs.
1010	Radiator Hose Clamps, Except at Thermostat	1/4-20	28 in. lbs.
1010	Radiator Hose Clamp at Thermostat	10-20	18 in. lbs.
NOTE: Refer to back of manual, Page 16-1, for bolt and nut markings, and steel classifications.			

GENERAL DESCRIPTION

NOTE: For information pertaining to the Fleetwood Eldorado bumpers, refer to the latter portion of this section.

The front bumper assembly, Fig. 14-1, is of a five-piece design that includes a sculptured center section, upper outer impact bars, and lower outer ends.

The rear bumper assembly, Fig. 14-3, consists of the following sections that are bolted together: a one-piece center section with license guard; fuel filler door, which also serves as license holder; and wrap-around outer ends.

SERVICE INFORMATION

1. Front Bumper Assembly Removal and Installation

a. Removal (Fig. 14-1)

1. Raise front end of car.

NOTE: Place a piece of masking tape on the lower edges of the front fenders behind the side marker lights and between the headlamps and parking lamps. Tape the comparable bumper areas. Draw horizontal and vertical crossed lines on each piece of tape. Measure and record the distance between each of the four horizontal line points for reinstallation.

2. Position a floor type jack so as to support bumper assembly at outer ends.
3. Remove clip securing radiator lower seal to bumper center section and move seal back out of way.
4. Remove two bolts, nuts and flat washers, both sides, that secure outer mounting bars to frame.
5. Remove two bolts, nuts and flat washers, both sides, that secure inner mounting bars to frame, and remove bumper.

b. Installation (Fig. 14-1)

1. With the aid of a helper, position bumper assembly on a floor type jack supporting outer ends. Raise to approximate car position.
2. Loosely install two bolts, nuts and flat washers, both sides, that secure inner mounting bars to frame.
3. Loosely install two bolts, nuts and flat washers, both sides, that secure outer mounting bars to frame.
4. Move the bumper assembly rearward until

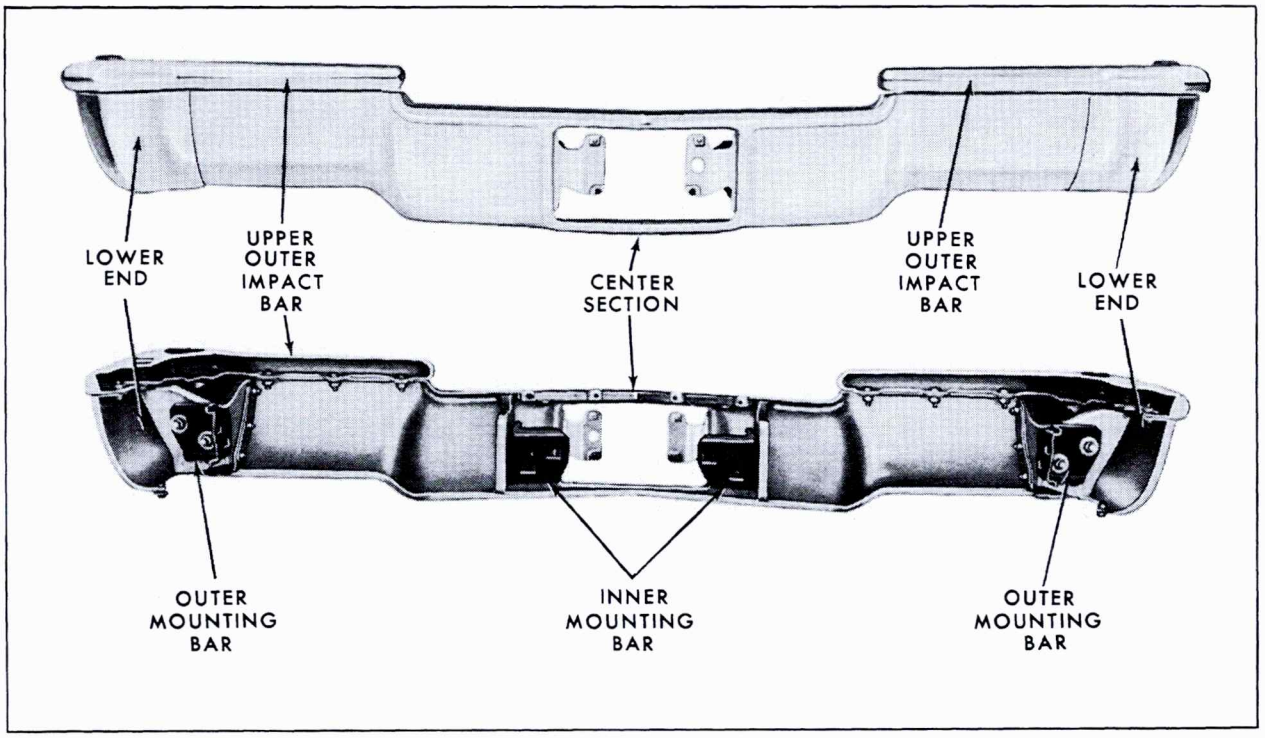


Fig. 14-1 Front Bumper - Front and Rear View

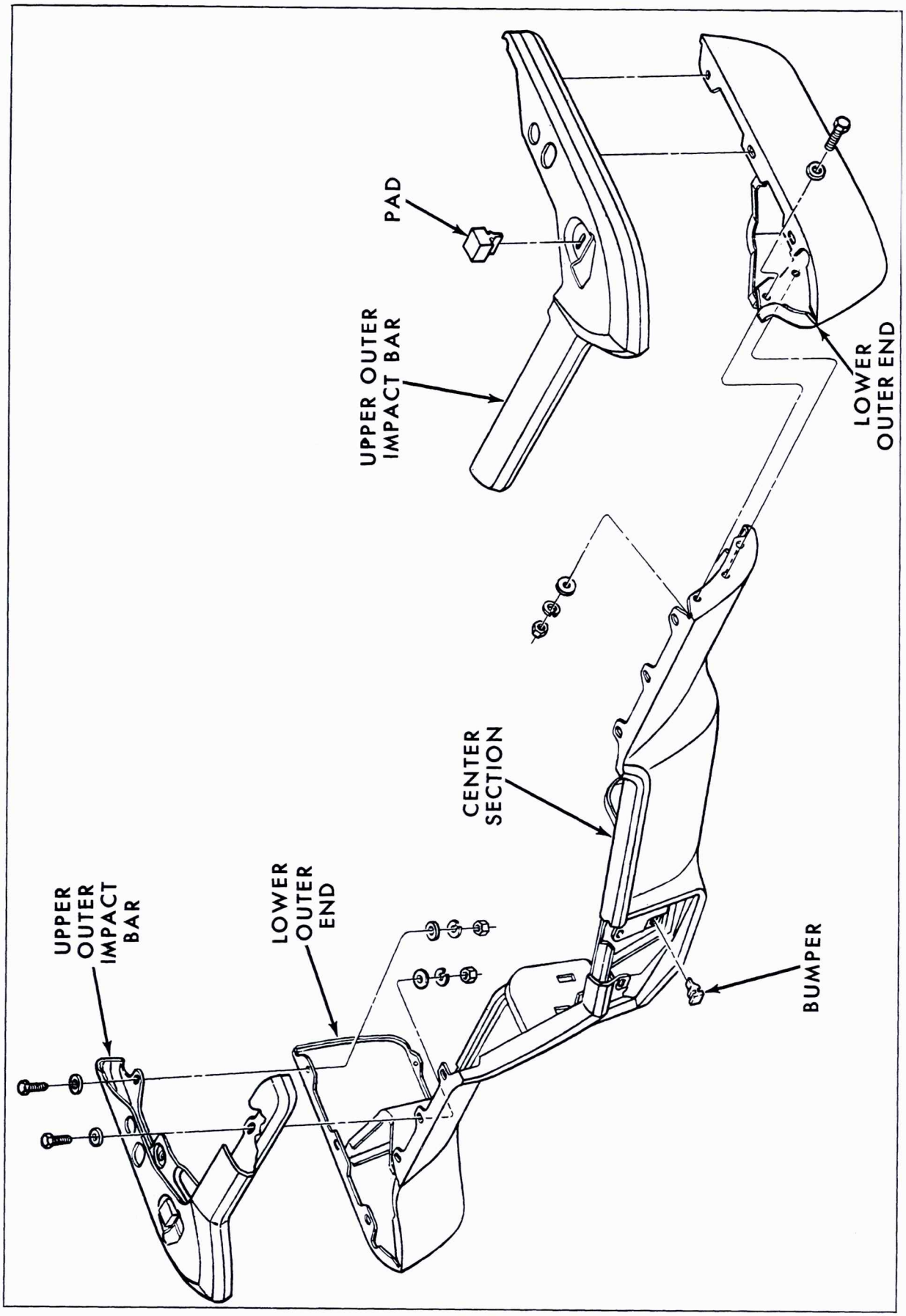


Fig. 14-2 Front Bumper Disassembled

the original fore and aft alignment is obtained, checking with the vertical lines.

5. Position radiator lower seal to bumper and secure with clip.

6. Raise the bumper assembly until the distance measured at time of removal is obtained at each of the four points using the horizontal lines.

7. Align bumper assembly as follows:

a. Horizontal (cross-car) alignment is obtained by means of the slots located at the inner mounting bars to frame bolts and the outer mounting bars to lower outer ends.

b. Vertical alignment is obtained by means of the slots located at the inner mounting bars to center section.

c. Fore and aft alignment is obtained by means of the slots located at the inner mounting bars to center section bolts and the outer mounting bar to frame bolts.

8. After alignment has been obtained, tighten mounting bar nuts to 50 foot-pounds.

9. Remove jack used to support bumper and lower car.

2. Front Bumper Outer Lower End Removal and Installation Right or Left

a. Removal (Fig. 14-2)

1. Remove front bumper as described in Note 1a.

2. Remove three nuts, bolts, flat and lock washers that secure upper outer impact bar to lower outer end.

3. Remove three nuts, bolts, flat and lock washers that secure lower outer end to center section.

4. Remove outer lower end.

b. Installation (Fig. 14-2)

1. Install lower outer end to center section with three nuts, bolts, flat and lock washers.

2. Install upper outer impact bar to lower outer end with three nuts, bolts, flat and lock washers.

3. Install front bumper as described in Note 1b.

3. Front Bumper Upper Outer Impact Bar Removal and Installation Right or Left

a. Removal (Fig. 14-2)

1. Remove front bumper as described in Note 1a.

2. Remove three nuts, bolts, flat and lock washers that secure upper impact bar to outer lower end.

3. Remove three nuts, bolts, flat and lock washers that secure upper outer impact bar to center section.

4. Remove upper outer impact bar.

b. Installation (Fig. 14-2)

1. Position upper outer impact bar on center section, align and install three nuts, bolts, flat and lock washers to secure upper outer impact bar to center section.

2. Install three nuts, bolts, flat and lock washers to secure upper outer impact bar to lower outer end.

3. Install front bumper as described in Note 1b.

4. Front Bumper Center Section Removal and Installation

a. Disassembly (Fig. 14-2)

1. Remove front bumper as described in Note 1a.

2. Remove both upper outer impact bars as described in Note 3a.

3. Remove both lower outer ends as described in Note 2a.

4. Remove center section.

b. Assembly (Fig. 14-2)

1. Install center section.

2. Install both lower outer ends as described in Note 2b.

3. Install both upper outer impact bars as described in Note 3b.

4. Install front bumper assembly as described in Note 1b.

5. Rear Bumper Assembly Removal and Installation

a. Removal (Fig. 14-3)

1. Open rear compartment lid.

2. Raise rear end of car.

3. Open fuel tank filler door and disconnect license lamp and fuel tank gage feed wire connector from body panel connector. Remove license lamp wire from connector.

4. Support bumper assembly with floor type jack. Cover contacting surface of jack to prevent damage to finish of lower portion of rear bumper.

5. Working through access holes in rear of side trim assemblies of luggage compartment, remove nut, flat washer and spacer, both sides, securing bumper cushion to body.

6. Reach under rear of fender and remove two nuts, bolts, and flat washers, both sides, securing bumper mounting brackets to frame.

7. With the aid of a helper, remove bumper assembly with mounting brackets attached.

b. Installation (Fig. 14-3)

1. With the aid of a helper, position bumper assembly on a floor type jack and raise to approximate car position.

2. Loosely install two nuts, bolts and flat washers, both sides, securing bumper mounting brackets to frame.

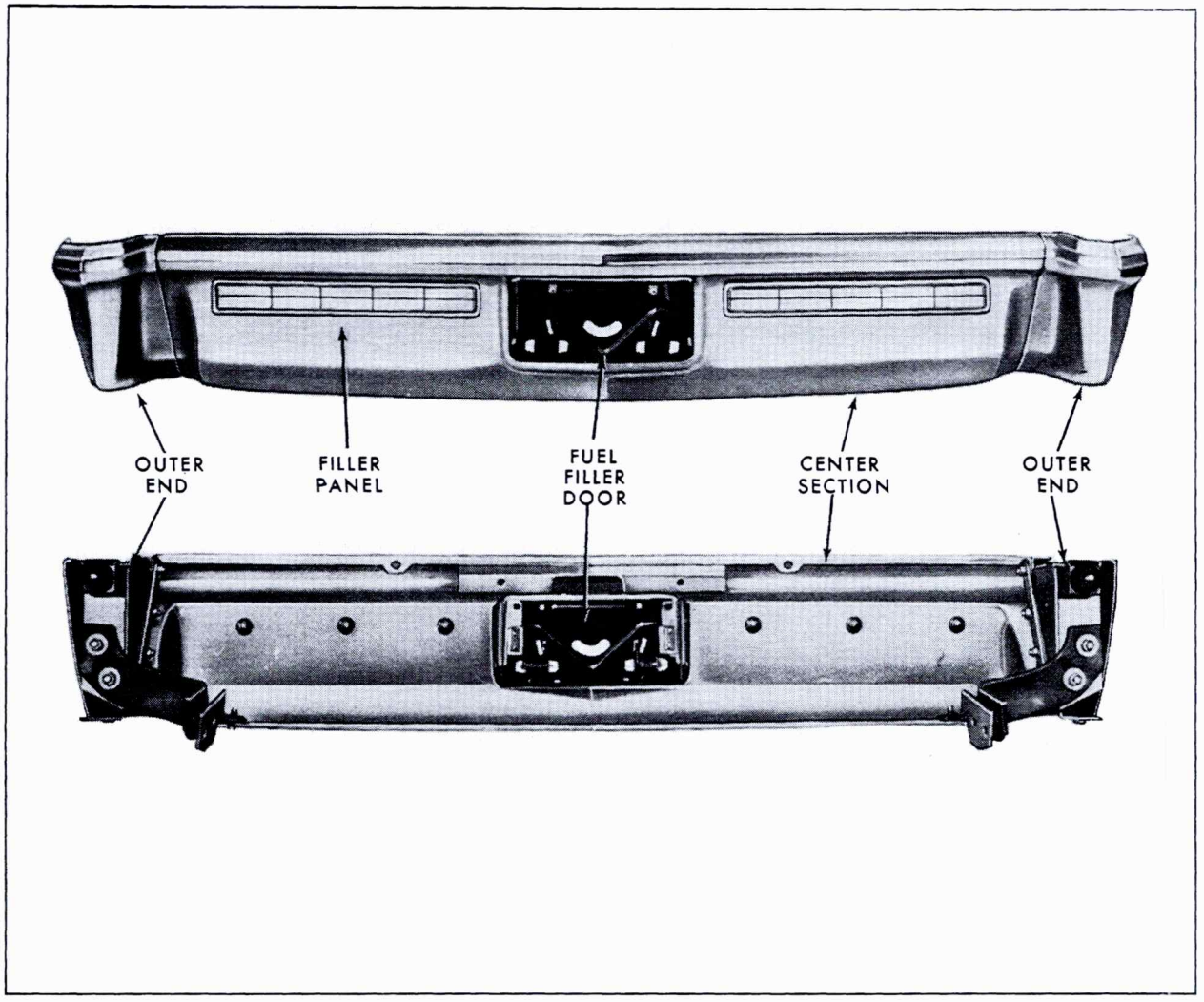


Fig. 14-3 Rear Bumper - Front and Rear View

3. An overall alignment of rear bumper assembly is obtained by using any one or all of the following adjustment combinations (Fig. 14-3 and 14-4).

a. Horizontal alignment is obtained by means of the slots located at the inner mounting brackets to bumper bolts, and outer mounting brackets to outer ends.

b. Vertical alignment is obtained by means of the slots located in the frame at the inner and outer mounting brackets to frame bolts.

c. Fore and aft alignment is obtained by means of the slots located at the inner and outer mounting brackets to frame bolts.

4. After obtaining alignment, Fig. 11-5, tighten mounting bolts to 50 foot-pounds.

5. Open fuel tank filler door and install license lamp wire into connector. Install this license lamp and fuel tank gage feed wire connector into body panel connector.

6. From inside rear compartment, install nut, flat washer and spacer, both sides, securing bumper cushion to body.

7. Remove jack used to position bumper.

8. Lower rear end of car.

9. Close rear compartment lid.

6. Rear Bumper Outer End Removal and Installation Right or Left

a. Removal (Fig. 14-4)

1. Remove rear bumper assembly as described in Note 5a.

2. Lay bumper assembly face down on a covered surface with a block supporting center section at end being removed.

3. Remove one nut, bolt, flat washer and rubber cushion from top of rear bumper outer end.

4. Remove two nuts, bolts and flat washers, both sides, securing rear bumper outer mounting brackets to outer end.

5. Remove four nuts, bolts, flat and lock washers and reinforcement plate securing outer end to center section.

6. Remove rear bumper outer end.

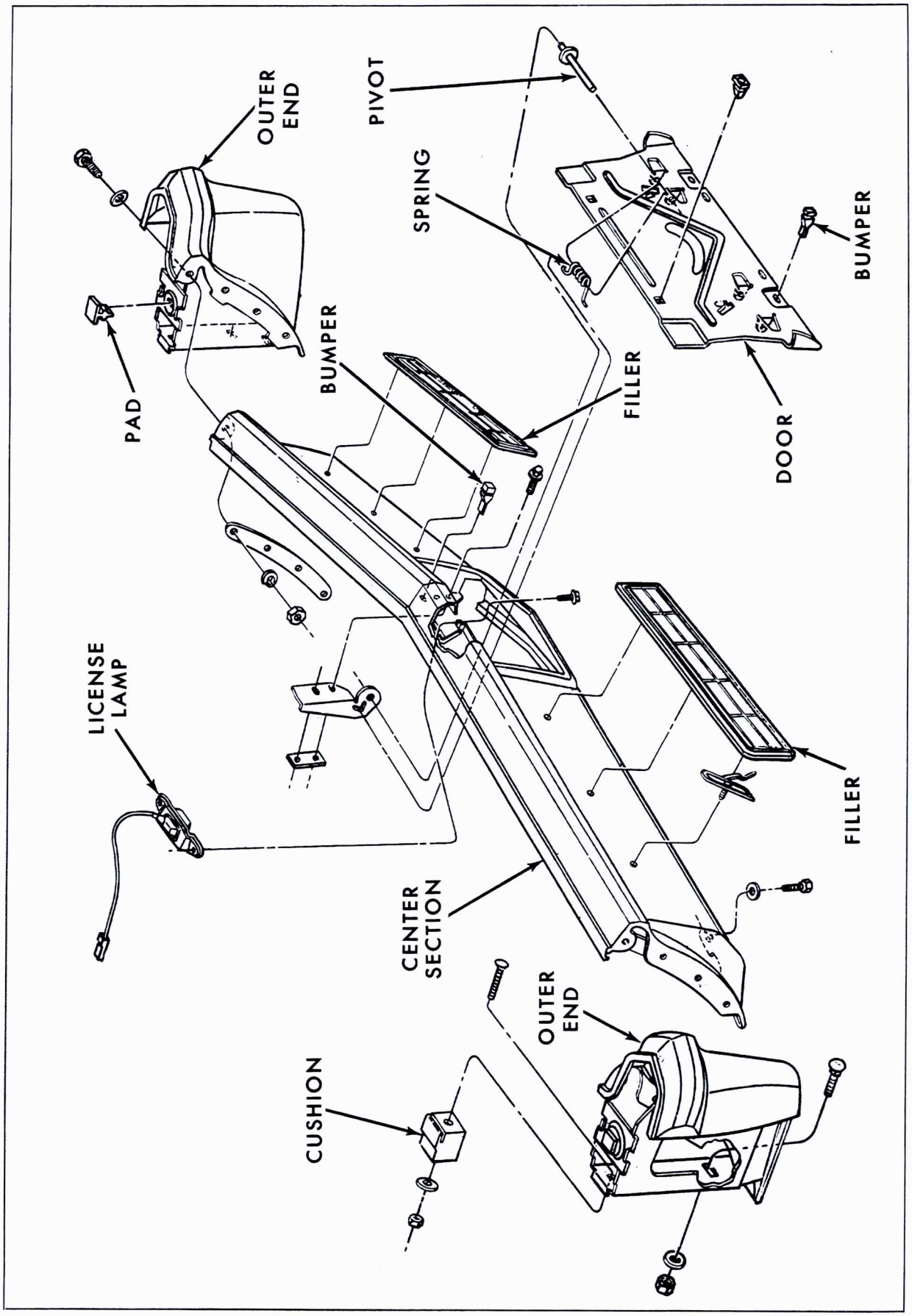


Fig. 14-4 Rear Bumper Disassembled

b. Installation (Fig. 14-4)

1. Position rear bumper outer end to center section and loosely install four nuts, bolts, flat and lock washers and reinforcement plate securing outer end to center section.
2. Loosely install two nuts, bolts and flat washers, both sides, securing rear bumper outer mounting brackets to outer end.
3. Install one nut, bolt, flat washer and rubber cushion to top of rear outer end.
4. Align outer end to center section and tighten securing bolts.
5. Install rear bumper assembly as described in Note 5b.

7. Rear Bumper Center Section Removal and Installation

a. Removal (Fig. 14-4)

1. Remove rear bumper assembly as described in Note 5a.
2. Remove both outer ends as described in Note 6a.
3. If working on Fleetwood or DeVille series, remove center section filler panels as described in Note 8a.
4. Remove fuel tank filler door as described in Note 9a.
5. Remove two screws that secure license lamp housing to center section.

b. Installation (Fig. 14-4)

1. Install two screws to secure license lamp housing to center section.
2. Install fuel tank filler door as described in Note 9b.
3. If working on Fleetwood or DeVille series, install center section filler panels as described in Note 8b.
4. Install both outer ends as described in Note 6b.
5. Install rear bumper assembly as described in Note 5b.

8. Center Section Filler Panels Removal and Installation

a. Removal (Fig. 14-4)

NOTE: Calais body styles use a center section without filler panels.

1. Open rear compartment lid.
2. Raise rear end of car.
3. Working through access holes in rear of side trim assemblies of luggage compartment, remove nut, flat washer and spacer, both sides, securing bumper cushion to body.
4. Reach under rear of fender and loosen two bumper mounting bolt nuts, both sides, and using a floor type jack move bumper assembly down and rearward.
5. Working through access between upper portion of center section and body, remove nuts and clips, both sides, and remove filler panels.

b. Installation

1. Position filler panels, align and secure to center section with nuts and clips.
2. Using a floor type jack, align bumper assembly as outlined in 5b to obtain proper tolerances shown in Fig. 11-5.
3. Reaching under rear of fender, tighten two bumper mounting bolt nuts, both sides, securing bumper mounting brackets to frame.
4. From inside rear compartment, install nut, flat washer and spacer, both sides, securing bumper cushion to body.
5. Remove jack used to position bumper.
6. Lower rear end of car.
7. Close rear compartment lid.

9. Fuel Tank Filler Door Removal and Installation

a. Removal (Fig. 14-4)

1. Holding filler door in the open position, release spring tension by pushing down on door end of springs and disconnect springs from filler door and mounting brackets.
2. Drop left side of door down and to the left disengaging pivot pins and remove door downward between bumper and frame.
3. Remove two screws, flat washers and tapping plate, both sides, securing mounting brackets to bumper and remove brackets.

b. Installation (Fig. 14-4)

1. Loosely install two screws, flat washers and tapping plate, both sides, securing outer mounting brackets to bumper.
2. Pass filler door up between bumper and frame and into open position. Engage filler door pins into mounting brackets; align door and tighten mounting bracket screws.
3. Engage door pivot springs in mounting brackets. Push other end toward filler door tensioning springs and engage in door.

TORQUE SPECIFICATIONS

Material Number	Application	Size	Foot Pounds
280M	Front Bumper Mounting Bar to Frame	1/2-20	50
280M	Rear Bumper Mounting Bar to Frame	1/2-20	50
280M	Front or Rear Bumper Mounting Bar to Bumper .	1/2-20	45
NOTE: Refer to back of manual, Page 16-1, for bolt and nut markings, and steel classifications.			

FLEETWOOD ELDORADO BUMPERS

GENERAL INFORMATION

The front bumper assembly for the Fleetwood Eldorado, Fig. 14-5, is of a four-piece design featuring a projecting lower center section, upper center impact bar, and projecting outer ends. A lower grille section is installed between the two center bars.

The rear bumper assembly, Fig. 14-7, consists of a center bar and two outer ends. The center bar provides for the mounting of the license plate light and rear reflex assemblies.

SERVICE INFORMATION

10. Front Bumper Assembly Removal and Installation

a. Removal (Fig. 14-5)

1. Raise front end of car.
2. Position a floor type jack to support bumper assembly.
3. Remove two nuts and angle bracket from each tie strut to radiator cradle lower attaching at bumper mounting bracket.
4. Remove self-locking nut and bolt from each tie strut upper attaching to radiator cradle and remove tie struts through lower seal.
5. Remove nut securing radiator lower seal to bumper center support lower bolt and move seal back out of way.
6. Remove two nuts, bolts and flat washers, both sides, securing inner mounting bars to frame.
7. Remove bolt and flat washer from bumper securing reinforcement rod from center of bumper to frame.
8. Remove two nuts, bolts and flat washers, both sides, securing outer mounting bars to bumper and remove bumper assembly.

b. Installation (Fig. 14-5)

1. Raise bumper assembly to approximate car position.
2. Loosely install two nuts, bolts and flat washers, both sides, securing outer mounting bars to bumper.
3. Loosely install two nuts, bolts and flat washers, both sides, securing inner mounting bars to frame.

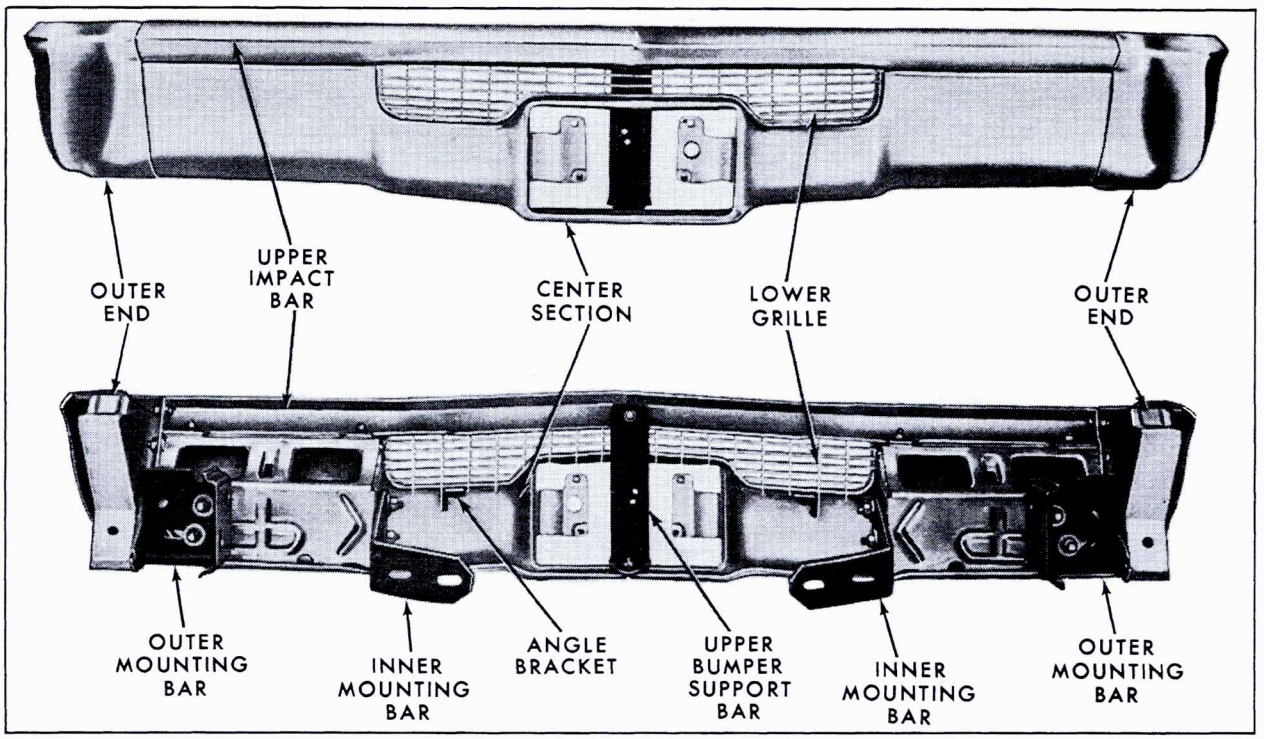


Fig. 14-5 Eldorado Front Bumper - Front & Rear View

4. Align bumper assembly as follows:
a. Horizontal alignment is obtained by means of the slots located at the inner bars to frame bolts and the outer mounting bars to center bar bolts.
b. Vertical alignment is obtained by means of the slots located at the inner mounting bars to frame bolts.
c. Fore and aft alignment is obtained by means of the slots located at the inner mounting bars to center bar bolts and the outer mounting bar to frame bolts.
5. Align bumper, Fig. 11-10, and tighten mounting nuts to 50 foot-pounds.
6. Install bolt and flat washer securing reinforcement rod from frame to front bumper.
7. Position radiator lower seal over bumper center support lower bolt and secure with nut.
8. Position tie struts through lower seal and inner mounting bars and secure both strut upper mountings to radiator cradle with self-locking nut and bolt.
9. Install angle bracket and two nuts, each strut lower mounting to bumper inner mounting bars.
10. Remove jack used to support bumper.
11. Lower front end of car.

11. Front Bumper Outer End Removal and Installation Right or Left

a. Removal (Fig. 14-6)

1. Remove front bumper as described in Note 10a.
2. Support bumper center section at end being removed.
3. Remove three nuts, bolts, flat and lock washers and reinforcement plate, securing outer end to lower center section.
4. Remove nut, bolt, flat and lock washers, securing outer end to upper center bar and remove bumper outer end.

b. Installation (Fig. 14-6)

1. Position outer end to center section and upper center bar and loosely install nut, bolt, flat and lock washers, securing outer end to upper center bar.
2. Loosely install three nuts, bolts, flat and lock washers and reinforcement plate, securing outer end to lower center section.
3. Align bumper outer end to center section and tighten.
4. Install front bumper as described in Note 10b.

12. Front Bumper Upper Impact Bar Removal and Installation

a. Removal (Fig. 14-6)

1. Remove front bumper as described in Note 10a.
2. Remove bolt and flat washer securing upper impact support bar to upper impact bar.
3. Remove nut, bolt, flat and lock washers, both sides, securing upper impact bar to outer ends.
4. Remove four washer faced nuts, bolts and flat washers, securing upper impact bar to lower center section and remove upper impact bar.

b. Installation (Fig. 14-6)

1. Position upper impact bar to lower center section and outer ends and loosely install four washer faced nuts, bolts and flat washers securing upper impact bar to lower center section.
2. Loosely install nut, bolt, flat and lock washers, both sides, securing upper impact bar to outer ends.
3. Loosely install bolt and flat washer securing upper impact support bar to upper impact bar.
4. Align upper impact bar to lower center section and outer ends and tighten.
5. Install front bumper as described in Note 10b.

13. Front Bumper Center Section Removal and Installation

a. Removal (Fig. 14-6)

Remove front bumper assembly as described in Note 10a.
2. Remove both outer ends as described in Note 11a.
3. Remove upper impact bar as described in Note 12a.
4. Remove lower grille assembly. Refer to Section 13, Note 5a.

b. Installation (Fig. 14-6)

1. Install lower grille assembly to lower center section. Refer to Section 13, Note 5b.
2. Install upper impact bar as described in Note 12b.
3. Install both outer ends as described in Note 11b.
4. Install front bumper as described in Note 10b.

14. Rear Bumper Assembly Removal and Installation

a. Removal (Fig. 14-7)

1. Raise rear end of car.
2. Open rear luggage compartment.
3. Position a floor-type jack to support bumper assembly.
4. Through license opening, disconnect fuel tank gauge and license lamp wiring connector from body end panel connector. Remove license lamp wire from connector.

NOTE: Record the number of shims used and their arrangement, if any, at the upper and lower bumper mountings for use at installation.

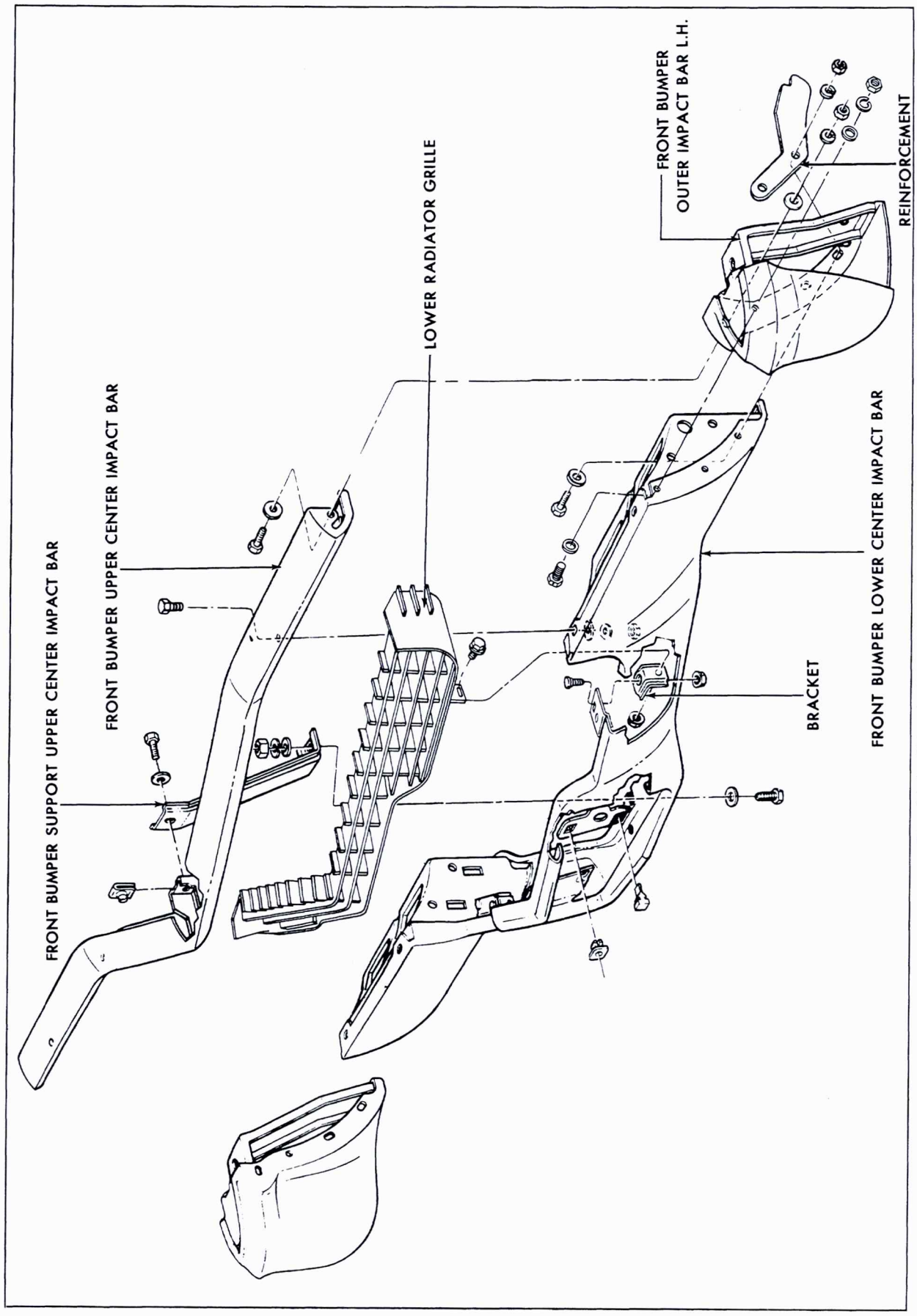


Fig. 14-6 Eldorado Front Bumper - Disassembled

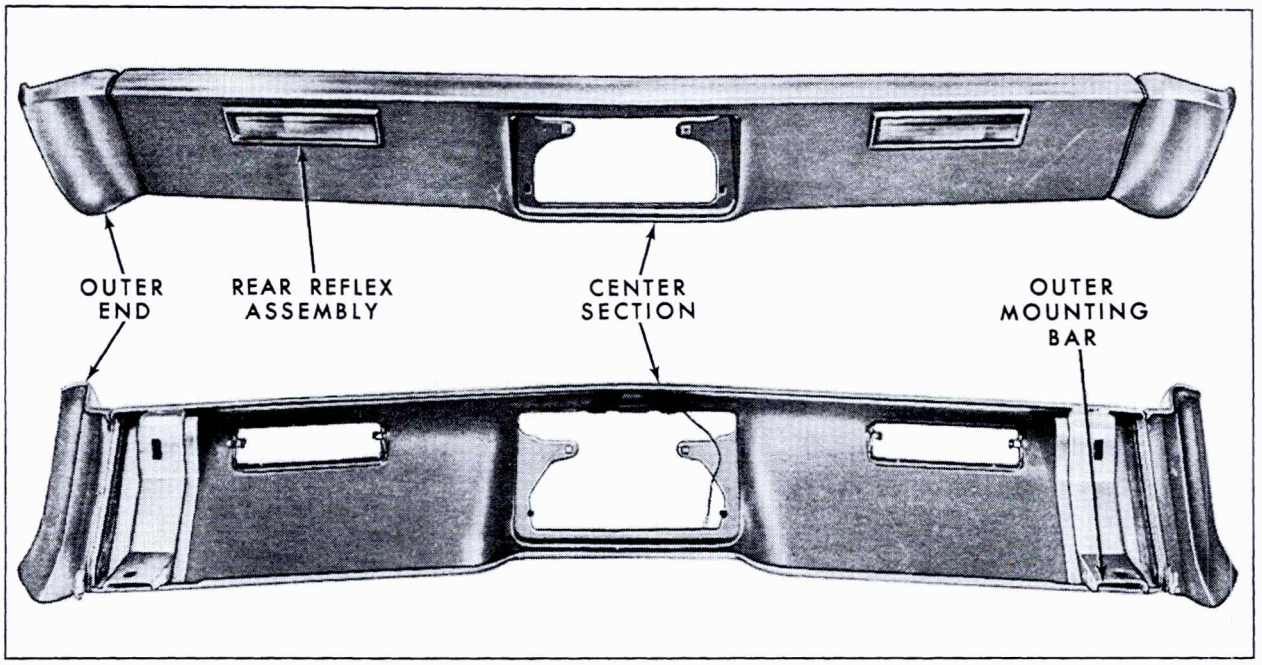


Fig. 14-7 Eldorado Rear Bumper - Front & Rear View

5. Remove bolt and flat washer, both sides, securing lower end of mounting bar to frame nut.
6. Through rear end panel inside of luggage compartment, below floor carpet, remove nut and flat washer, both sides, securing upper end of mounting bar to body.
7. Remove bumper assembly by pulling rearward.

b. Installation (Fig. 14-7)

1. Raise bumper assembly to approximate car position.
2. Using recorded number and arrangement of shims, install nut and flat washer, both sides, securing upper end of mounting bar to body.
3. Using recorded number and arrangement of shims, install bolt and flat washer, both sides, securing lower end of mounting bar to frame nut.
4. Install license lamp wire into wiring connector and install connector into body end panel connector.
5. Install floor carpet and close rear luggage compartment lid.
6. Remove jack used to support bumper.
7. Lower rear end of car.

15. Rear Bumper Outer End Removal and Installation Right or Left

a. Removal (Fig. 14-8)

1. Remove rear bumper assembly as described in Note 14a.
2. Lay bumper assembly face down on a covered surface with a block supporting center section at end being removed.
3. Remove three bolts, flat and lock washers, reinforcement plate and retainer, securing outer end to center impact bar and remove outer end.

b. Installation (Fig. 14-8)

1. Position bumper outer end to center impact bar and secure with three bolts, flat and lock washers, reinforcement plate and retainer.
2. Install rear bumper assembly as shown in Note 14b.

16. Rear Bumper Center Section Removal and Installation

a. Removal (Fig. 14-8)

1. Remove bumper assembly as described in Note 14a.
2. Remove both outer ends as described in Note 15a.
3. Remove screw and spacer, both sides, securing license plate lamp to center section and remove license plate lamp.
4. Remove nut, flat washer and angle bracket, both sides, securing rear reflex assembly to bumper, and remove both assemblies.

b. Installation (Fig. 14-8)

1. Install both rear reflex assemblies using one nut, flat washer and angle bracket, both sides, for each assembly.
2. Install screw and spacer, both sides, securing license plate lamp to rear center section.
3. Install outer ends as described in 15b.
4. Install rear bumper assembly as described in Note 14b.

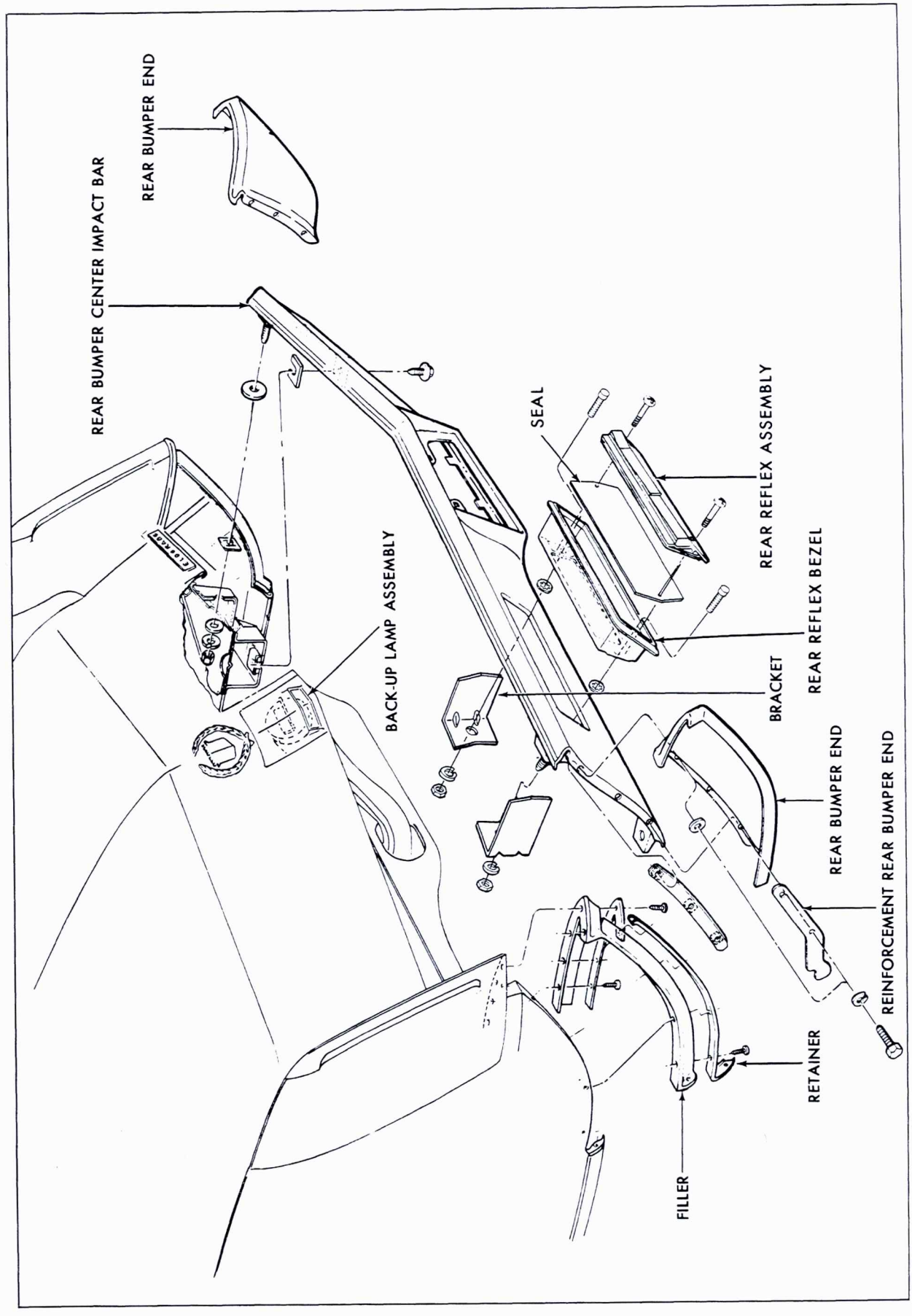


Fig. 14-8 Eldorado Rear Bumper - Disassembled

TORQUE SPECIFICATIONS

Material Number	Application	Size	Foot Pounds
280M	Front Bumper Mounting Bar to Frame	1/2-20	50
280M	Rear Bumper Mounting Bar to Body	1/2-20	85
280M	Front or Rear Bumper Mounting Bar to Bumper .	1/2-20	45
280M	Radiator Tie Strut	1/2-20	35
NOTE: Refer to back of manual, Page 16-1 for bolt and nut markings, and steel classifications.			

TABLE OF CONTENTS

GENERAL DESCRIPTION

RADIO & ANTENNA

Four radios are available as optional equipment for 1969 cars -- an AM signal seeking radio, Fig. 15-1, an AM/FM radio, Fig. 15-2, an AM signal seeking radio for 697 styles (rear remote control) and an AM/FM stereo radio, Fig. 15-3. The signal seeking radios and the AM/FM radio consist of a receiver unit and two separate speaker units. The stereo radio consists of a receiver unit, a separate demodulator-audio amplifier unit, and four separate speaker units. The radio receiver unit is located in the instrument panel, to the right of the steering column in all models. The demodulator-audio amplifier unit used on stereo installations mounts to the right of the radio.

On AM/FM stereo radios, the left front and right rear speakers use one channel, and the right front and left rear speakers are on the remaining channel.

On non-stereo installations, the front speaker is mounted near the center of the upper instrument panel cover. The rear speaker is located in the trunk compartment and is attached to the rear parcel shelf, except on convertible styles, where it is located in a recessed section of the rear seat back. On stereo installations, there are two 3-1/2 inch round speakers on each side of the upper instrument panel cover and two 6 inch x 9 inch speakers on each side of the rear shelf. On convertibles, the rear stereo speakers are mounted behind the seat in the well for the convertible top.

All receivers are equipped with five pushbuttons. The pushbutton feature provides the owner with a choice of five favorite stations. Any of these five stations is mechanically tuned in by depressing one of the five pushbuttons located directly below the dial. The pushbuttons may be used for AM or FM reception depending upon the position of the band mode switch.

The same antenna, of the extendable rod type, is provided for all radios. It is electrically operated from inside the car by the push buttons above the radio dial, one on each end of the band mode switch. Depressing the left button lowers the antenna, and depressing the right raises it. A triangular mark on each button points in the direction the antenna travels when the button is depressed.

The antenna is operated by a reversible electric motor. The motor drives a gear and pulley assembly that extends or retracts a plastic cable fastened to the smallest of three antenna sections. The action of the plastic cable, as it is extended, forces the antenna rod upward.

In lowering the antenna, the plastic cable is retracted. This pulls the three sections of the antenna rod downward.

CAUTION: Do not raise or lower the antenna by hand. Always use the antenna push buttons otherwise the operating mechanism may be damaged.

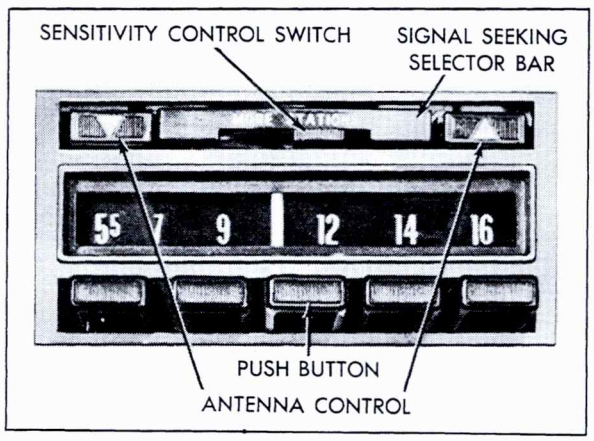


Fig. 15-1 AM Receiver Dial

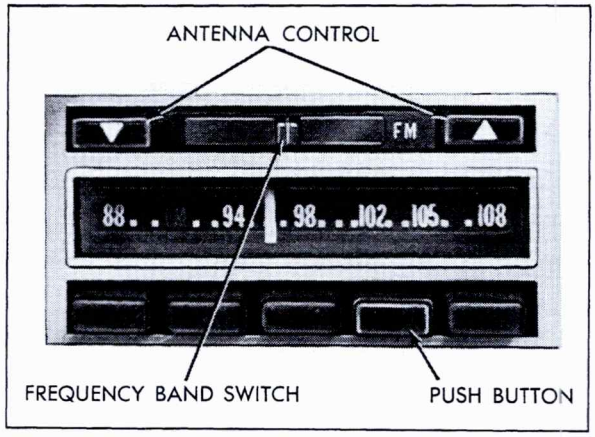


Fig. 15-2 AM/FM Receiver Dial

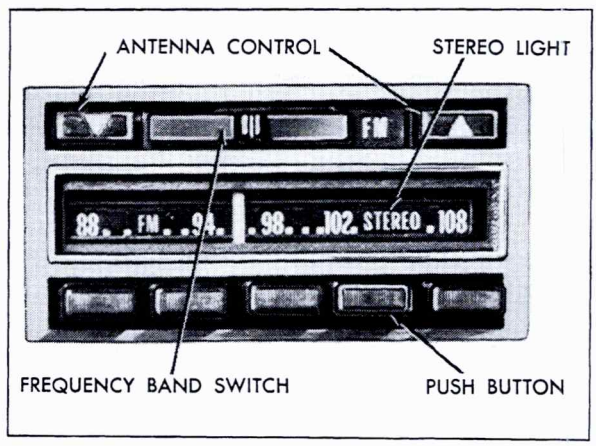


Fig. 15-3 AM/FM Stereo Dial

On cars equipped with AM/FM or AM/FM stereo receivers, the antenna tip should be approximately thirty inches above the fender to obtain the best FM reception. (Higher or lower heights may produce more fading or flutter).

AM/FM and AM/FM Stereo Radio

The AM/FM and AM/FM Stereo Radios have advantages and limitations that must be explained to owners who are not familiar with the operation of FM units.

The frequencies (88-108MC) at which FM stations operate create much shorter radio wave lengths than those produced in AM broadcasting. Unlike AM signals, FM signals do not bend around the horizon. This limits the distance at which FM signals can be received. The dependable range of FM transmission is a radius of approximately twenty miles from the transmitting antenna.

When the FM receiver moves out of range of the FM transmitter, it enters what is referred to as the fringe area. In the fringe area, the strength of the FM signal may vary rapidly, causing a flutter or a series of noise bursts as the car moves between high and low level signal points.

A second effect found in the fringe area is the presence of ignition interference from adjacent vehicles. In both instances, it may be possible to improve reception by retuning; however, it may be necessary to change to a different station, if reception still is not good.

Retuning should be necessary only in those few instances when reception becomes slightly noisy while driving through areas such as the center of a large city and a weak signal is being received from a station located away from the center of the city. The interference can be quieted by adjusting the tone control for more bass, and by shifting the speaker fader to favor the rear seat.

While these adjustments will slightly diminish stereo effect on cars so equipped, they will substantially reduce background noise interference.

As soon as reception clears, reset the tone control to the normal detent and again adjust the front and rear speakers for equal output.

The Cadillac AM/FM or AM/FM Stereo Radio is equipped with automatic frequency control, which aids tuning to a station. The FM receiver should be turned directly on station frequency for minimum noise interference; however, the automatic frequency control will tune directly to and lock on station frequency when slight mistuning is encountered.

Another feature of FM tuning is signal separation. When two FM stations are close in frequency, the FM tuner selects the stronger signal, completely rejecting the weaker one. This is in contrast to AM performance, where it is not always possible to separate two stations.

The Cadillac AM/FM Radio incorporates an AM receiving circuit and an FM receiving circuit. The audio system is common to both receiving circuits.

The Cadillac AM/FM Stereo Radio incorporates an AM receiving circuit, an FM receiving circuit and stereo detection circuit. A dual channel audio amplifier on a separate chassis mounts below the instrument panel cover to the right of the radio and is not visible from the passenger compartment.

The signal seeking feature is not provided on the AM/FM or AM/FM Stereo radio. An AM/FM frequency band switch is located above the frequency band on the receiver dial, in place of the selector bar.

Moving the sliding bar to the left selects the FM band and to the right, the AM band. To simplify tuning, only the dial for the frequency band selected is visible. The letters "AM" or "FM" light on the left side of the dial and also appear next to the sliding bar showing the frequency band selected.

On the stereo model, stereo indicator bulbs in the right side of the dial, as shown in Fig. 15-3, light when the FM station tuned is capable of transmitting stereo. The illumination of these bulbs, however, does not always mean the station is transmitting stereo at the particular moment. The bulb will not light on any AM station, since stereo programs are not broadcast on this band.

Signal Seeking Tuner

The signal seeking tuner, provided on AM radios, is electronically controlled so that the operator may change stations by depressing the selector bar. The signal seeking operation consists of a low to high frequency sweep (left to right) of the broadcast band by the tuner.

When the selector bar is depressed, the tuner moves to the station of next higher frequency (to the right) and stops automatically at the point where that station is best received. This action takes place each time the selector bar is depressed. When the tuner has reached the point of highest frequency of the broadcast band, it returns to the low frequency (left) side of the broadcast band and begins a new sweep to the right, stopping at the first receivable station. The above procedure is then repeated when the bar is again depressed.

A foot control switch, which performs the same station selecting function as the station selector bar, is available for the AM radio only for dealer installation.

The stopping sensitivity of the signal seeking tuner may be varied by changing the position of the three-position sensitivity control switch located just below the center of the selector bar. (Fig. 15-1)

The circuit diagram for radios is illustrated in Fig. 15-4.

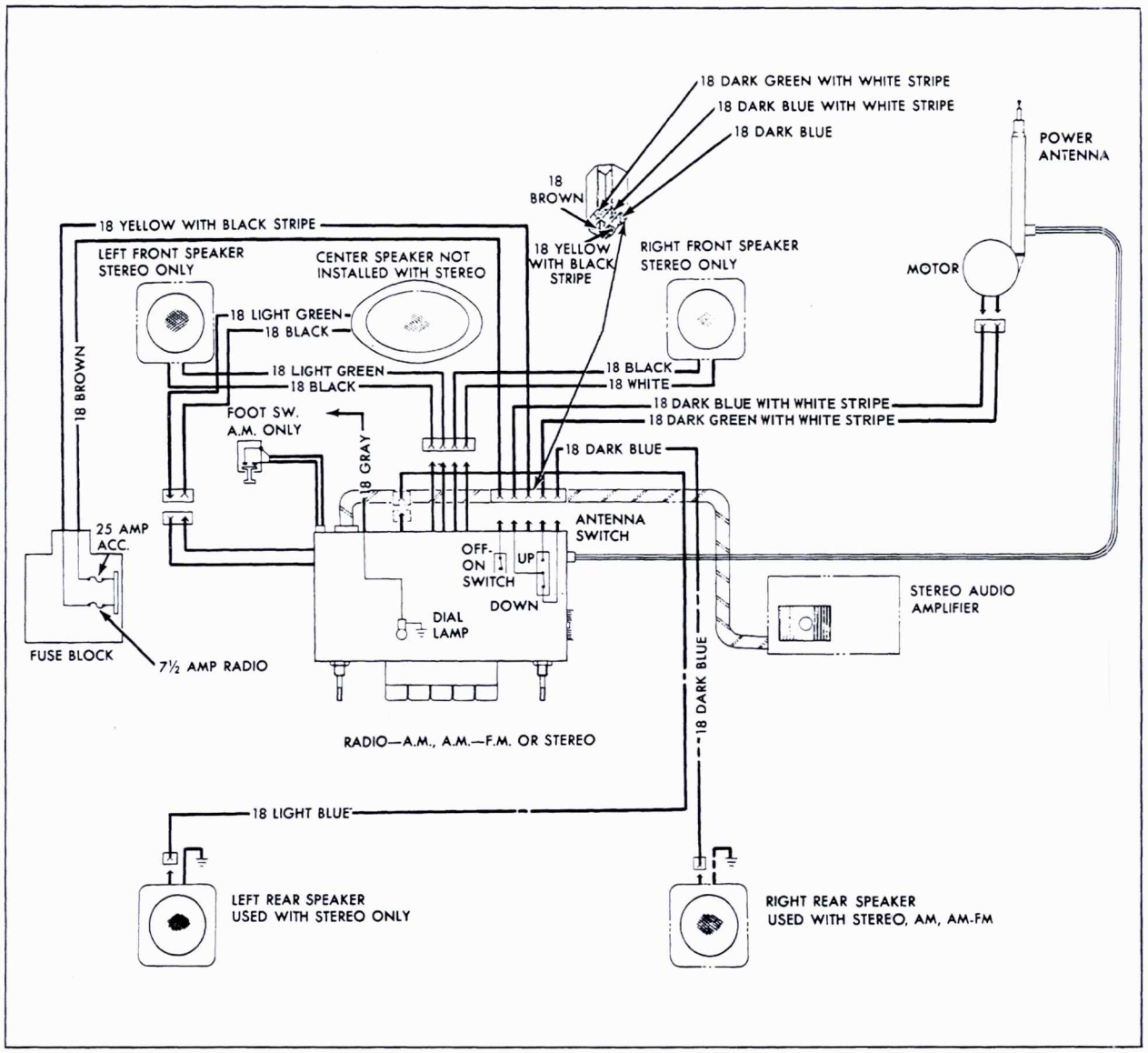


Fig. 15-4 Radio Circuit Diagram

SERVICE INFORMATION

1. Radio Controls, Operation

a. Switch Volume and Tone Control (AM, AM/FM Radios or AM/FM Stereo Radios)

The left knob turns the radio ON and OFF, and controls the volume. On the stereo radio, the knob controls the volume in both channels simultaneously. The ring is turned counterclockwise for bass tones and clockwise for treble tones. When indexed at the detent, it provides a balanced normal tone. On the stereo radio, this control varies the tone in both channels simultaneously.

For best stereo reception, neutralize the tone control by turning it to the center detent position, then adjust the front and rear speaker control as outlined in sub-section b of this note so that the sound is balanced to your ears. Centering the tone control permits full frequency response from the speakers, and balanced speaker output is needed for greatest stereo effect.

b. Manual Station Selector and Speaker Control (AM, AM/FM or AM/FM Stereo Radios)

The right knob is used to tune stations manually. The ring on the knob is the speaker control. When the ring is turned all the way clockwise, on AM and AM/FM models, volume of the front speaker is increased. As the ring is turned counterclockwise, the front speaker volume decreases while the rear speaker volume increases. When the ring is turned all the way counterclockwise, the rear speaker is stronger.

On AM/FM stereo models, adjusting the ring changes the volume between the front pair of speakers and the rear pair of speakers. If the ring is in a complete clockwise position, volume of the front pair will be louder. If the ring is in a complete counterclockwise position, volume of the rear pair of speakers if louder. This control has no effect on the balance of stereo channels.

c. Push Button Tuning (AM, AM/FM or AM/FM Stereo Radios)

After the five pushbuttons are set to the owner's five station selections, it is necessary only to push any button to tune in the station for which the button is set, and the corresponding band switch on AM/FM or AM/FM Stereo radios.

AM/FM Stereo radios should always be fine-tuned to assure maximum signal response, even though pre-set by the push-button control.

d. Automatic Tuning (AM Radios Only)

To use automatic tuning, depress the selector bar above the dial momentarily. Any station within range of the receiver can be obtained by holding the bar depressed until the dial pointer approaches the desired frequency, and then releasing the bar. The automatic tuner will seek immediately when the selector bar is depressed.

e. Sensitivity Control (AM Radios Only)

The three-position slide switch, located below the center of the selector bar, controls the station selecting sensitivity of the signal seeking tuner. By moving the switch to its most sensitive position (right), it is possible for the tuner to pick up all receivable stations by depressing the selector bar. When the switch is moved to its intermediate position (center), the tuner will not select any of the weakest stations, and with the switch in its least sensitive position (left), only the strong stations will be selected.

f. Frequency Band Switch (AM/FM or AM/FM Stereo Radios Only)

The frequency band switch is located above the frequency dial. Sliding the bar to the right connects the radio for AM reception, rotates the dial to the AM frequency band and illuminates the AM tell-tale light located on the left side of the dial. Sliding the bar to the left connects the radio for FM reception, rotates the dial to the FM frequency band and illuminates the FM tell-tale light located on the left side of the dial. Stereo broadcasts can be received on the FM band only.

g. Rear Seat Remote Control 697 Styles (AM Radios Only)

A rear seat radio remote control is available as an accessory for 697 style cars equipped with the signal seeking AM radio. The remote control consists of an ON-OFF volume control, a sensitivity control, and a selector button. It is located in the right rear arm rest.

The rear seat remote control overrides the front radio controls. Once the remote control is turned ON, the front controls, with the exception of the pushbuttons and manual tuner, will not operate the radio until the remote control is turned OFF. With remote control turned OFF, all front controls will operate normally.

The ON-OFF volume control knob turns the radio ON and OFF, and controls the volume. The sensitivity control is located beneath the ON-OFF volume control knob. Rotating the control counterclockwise permits the tuner to stop only on the strong signals. In the middle position, the tuner will stop on weaker signals. Rotating the control clockwise permits the tuner to stop at the weakest receivable signals.

When the remote control is ON, the red selector button is illuminated. Depressing this button performs the same function as pressing the selector bar.

2. Radio Noise Suppressors

a. Static Collectors

If a crackling noise is heard from the radio when the car is in motion and disappears as brakes are applied, static collectors should be installed in both front wheels in service.

Front wheel static collectors consist of helical coil copper inserts. If needed, they should be installed in the front hub dust caps against the steering knuckle spindles. The areas they are grounded against must be free of grease or oil to assure proper operation.

Care must be taken before installing the dust cap to peen over the end of the spindle nut cotter key until it is flat against the side of the nut. This will prevent the static collector from catching on the cotter key and breaking.

b. Ignition Suppressors

Various types of ignition suppressors are used to prevent spark noise from interfering with radio reception. Failure of any of these parts to function properly is accompanied by a popping noise. The noise increases as the engine is accelerated, and varies with engine speed. If this interference is present, check the following suppressors:

1. Ignition noise is suppressed by use of resistance core ignition cables. Check for a defective or open cable. The resistance of these cables is 2,000 to 6,000 ohms per foot.

2. Two ground cables, one across each of the upper suspension arms, should be checked for breaks and proper ground contact on all but 693 style.

3. Two ground straps, one from each cylinder head to cowl, should be checked for breaks and proper ground contact on all but 693 style.

4. On all but 693 style, check ground cable from negative battery cable at frame to radiator cradle.

5. On 693 style, check ground cable between transmission housing and cowl, in the generator

right dust shield (in harness), the radiator cradle to frame, and the clip between the hood and right fender.

6. It is particularly important that the terminals in the ignition secondary cables make good mechanical contact with the spark plug terminals and distributor cap terminals. Failure at these points will result in excessive ignition noise, seriously reducing FM performance.

7. Check ground from generator to right front cradle-to-wheelhouse brace.

c. Regulator Capacitor

A capacitor is mounted on the generator regulator to prevent regulator operation from interfering with radio reception. A whining sound that increases in pitch as engine speed is increased is an indication of a faulty regulator capacitor.

If replacing the regulator capacitor fails to eliminate the whining, the capacitor built into the end frame of the generator is probably defective and should be replaced. A defective diode in the generator can also cause this noise.

d. Blower Motor Capacitor

A capacitor is mounted on blower motor assembly for suppressing radio noise at high blower speed on cars equipped with AM/FM or AM/FM Stereo radio. If whine is eliminated when Automatic Climate Control or heater is turned OFF, this capacitor should be replaced.

e. Antenna Motor and Engine Electrical Noise

Excessive antenna motor and engine electrical noise is often caused by the antenna lead-in cable ferrule at the antenna mast not being properly installed. This condition can be corrected by removing and then reconnecting the antenna lead-in cable, and tightening retaining nut.

3. Minor Adjustments

a. Antenna Trimmer Adjustment

1. Turn radio on. On cars equipped with AM/FM receivers, switch to AM reception.

2. Extend antenna fully.

3. Tune in a weak station between 600 and 1200 KC on AM band and turn volume control to maximum.

4. Adjust antenna trimmer, located behind right control knob, for maximum volume. Access to antenna trimmer is gained by pulling off right control knob and ring and using a screwdriver to adjust the screw located behind the control knob, Fig. 15-5.

NOTE: If, during adjustment, the station becomes strong, tune to a weaker station and continue the adjustment.

5. After adjusting trimmer for best AM reception, check performance of FM band on AM/FM radios. It may be necessary to adjust antenna height in very weak signal areas. To obtain best FM reception, tip of antenna should be approximately 30 inches above fender.

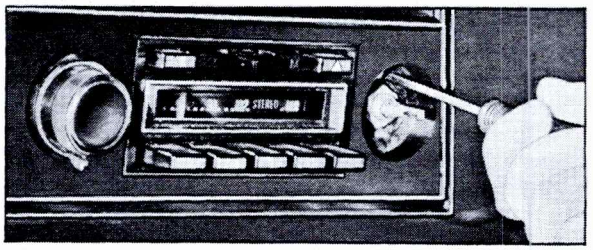


Fig. 15-5 Adjusting Antenna Trimmer

b. Push Button Station Selection

1. Unlatch push button by pulling it straight out.

2. Carefully tune in desired station for optimum reception and then push button in all the way. Then, whenever this button is pushed, the preset station will be selected.

3. Repeat above procedure for the four remaining buttons.

c. Balance Adjustment (AM/FM Stereo Models Only)

If the sound appears to be louder on one side of the car than the other, an adjustment called the balance adjustment may be made.

CAUTION: On some stereo programming, it is normal for one side to be louder than the other for a short time. This is done purposely for stereo effect. The only positive method to tell if the balance control needs adjustment is to tune in a non-stereo program and make a critical evaluation, in which the owner may assist.

If adjustment is needed, proceed as follows:

1. Remove steering column lower cover as described in Section 12, Note 45a.

2. With radio playing and fader control turned fully clockwise, insert screwdriver into balance control screw on lower rear left corner of radio, Fig. 15-6. Rotate balance control adjustment clockwise or counterclockwise until the sound in the left and right speakers appears to have equal volume on a monaural AM station.

3. Install steering column lower cover as described in Section 12, Note 45b.

4. Minor Repair Procedures

Many conditions that affect radio operation may be corrected without removing set from car. Check condition and, using diagnosis chart at end of Section, perform the operation or operations necessary to correct the condition. If these minor repairs are not effective, radio should be removed from car and repaired at an authorized radio service station.

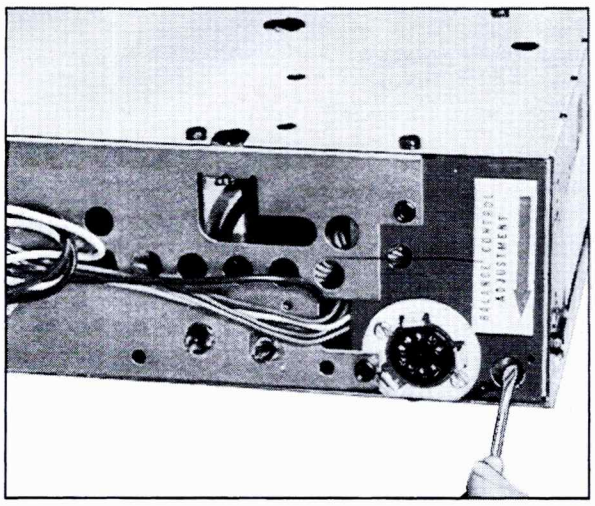


Fig. 15-6 Stereo Balance Adjustment

CAUTION: Do not turn on radio with either speaker disconnected, as the audio transistor may be permanently damaged.

a. Fuse (AM Radios Only)

A thump should be heard when the radio is turned on. If thump is not heard, check fuse and replace with one of correct amperage. If fuse blows the second time during signal seeking and return operation, the radio should be sent out for repairs.

b. Battery

Check battery and make sure that it is fully charged.

c. Speaker Connections

Check speaker leads for possible open circuit or ground. Remember, there are four speakers in stereo installations.

d. Antenna

Use a test antenna and lead-in plugged into the set with test antenna held outside car. If radio works satisfactorily with this test assembly, car antenna should be checked for a short or ground, and lead-in should be checked for continuity. Test antenna mast for shorts to ground while wiggling antenna.

If a ground is indicated in this test, disassemble antenna and check for defective insulators or presence of water or moisture in body tube. Test with volt-ohm meter from end of either lead-in tip to ground. If lead-in test shows a ground, replace lead-in.

The conditions mentioned above will cause a weak or intermittent signal and will cause signal seeker to sweep back and forth across the dial when tuning bar is depressed while car is in an unusually weak signal area, such as in a building or under a viaduct. The mast assembly must be raised slightly above the fender for radio reception. Do not remove the set to correct this condition until all previous checks on the antenna have been made with the car in a fairly strong signal area.

e. Antenna Trimmer

If antenna is not trimmed, the set will have weak and fading AM reception. Antenna trimming should always be performed before the new car is delivered or after any radio or antenna repair work is completed. See Note 3a.

5. Radio Receiver Unit

The procedure for removing and installing the radio receiver unit is described in Section 12, Note 63.

6. Audio Amplifier Unit

The procedure for removal and installation of the audio amplifier unit is described in Section 12, Note 64.

7. Radio Front Speaker

The procedure for removing and installing the radio front speaker or speakers is described in Section 12, Note 65.

8. Radio Rear Seat Speaker— Except Convertibles

a. Removal

NOTE: Access to rear speaker is gained through trunk compartment.

1. Disconnect speaker lead (dark blue) from connector at rear of speaker. This is a light blue lead on the AM/FM Stereo left rear speaker.
2. Remove four nuts securing speaker to rear compartment shelf and remove speaker.

b. Installation

1. Install speaker to rear compartment shelf and tighten four attaching nuts evenly to a maximum of 12 inch-pounds to prevent speaker distortion.
2. Connect speaker lead (dark blue) to connector at rear of speaker. This is a light blue lead on the AM/FM Stereo left rear speaker.

9. Radio Rear Seat Speaker and Grille— Convertibles Without Stereo

Access to rear seat speaker and grille is gained through rear passenger compartment.

a. Removal

1. Remove rear seat cushion.
2. Remove rear seat back.

3. Remove valance from rear of seat back.
4. Remove four Phillips screws securing speaker assembly at rear top center of seat back.
5. Lift speaker assembly out and up at bottom of recess in center of seat back.
6. Disconnect speaker leads from speaker.
7. Remove screw securing black ground lead.
8. Remove four sheet metal screws securing speaker to baffle and remove speaker.
9. Remove four Phillips screws securing speaker grille to baffle and remove grille. It is not necessary to remove rear speaker grille when removing speaker, unless grille is to be replaced.

b. Installation

1. Install speaker grille on baffle and secure with four attaching screws.
2. Install speaker on baffle and secure with four attaching screws.
3. Secure black ground lead with attaching screw.
4. Connect speaker leads to speaker.
5. Install speaker assembly in recess in center of seat back and secure with four attaching screws.
6. Install valance on rear of seat back.
7. Install rear seat back.
8. Install rear seat cushion.

10. Radio Rear Seat Speaker—Convertibles with Stereo

a. Removal

1. Remove top well upper trim.
2. Remove four Phillips head attaching screws and remove grille.
3. Peel back top well canvas.
4. Remove four speaker enclosure mounting screws and screw securing black ground wire.
5. Disconnect speaker lead (dark blue on right side or light blue on left side.)
6. Remove speaker assembly with enclosure.
7. Remove four nuts securing speaker to enclosure.

b. Installation

1. Install four nuts securing speaker to enclosure.
2. Position speaker with enclosure.
3. Connect speaker lead (dark blue on right side or light blue on left side).
4. Install four speaker enclosure mounting screws and screw securing black ground wire.
5. Position top well canvas.
6. Install grille with four Phillips head attaching screws.
7. Install top well upper trim.

11. Rear Seat Remote Control Unit—(697 Styles)

a. Removal

1. Remove rear seat cushion by lifting forward edge and pulling forward.
2. Remove rear seat back by removing two screws along lower edge of back and lifting assembly off mounting hooks.
3. Remove five screws securing right quarter window garnish molding and remove molding.
4. Remove six screws retaining right arm rest assembly.
5. Remove tape securing excess cable behind arm rest assembly.
6. Remove right front and rear door sill plates.
7. Remove right front kickpad.
8. Peel back rug to gain access to harness protection conduit along right sill.
9. Remove upper instrument panel top cover as described in Section 12, Note 44a.
10. Disconnect cable assemblies at rear corner of radio.
11. Remove three clips and remove cable from shroud vent duct and hinge pillar area.
12. Thread cable through harness conduit in rear partition.
13. Loosen set screw in knob assembly and remove knob assembly, felt washer, and sensitivity ring.
14. While holding control and cable assembly in one hand, remove jamb nut, radio trim plate and second jamb nut securing assembly to escutcheon.
15. Route cable out of right rear armrest assembly.

b. Installation

1. Thread plug end of cable forward through hole in line with harness conduit in rear partition.
2. Route cable to radio through hinge pillar area and along shroud vent duct.
3. Connect cable assemblies at left rear corner of radio. Ground remote control head in rear compartment. Turn on radio and test for operation. Extend antenna fully and peak antenna trimmer on weak station between 600 and 1200 kilocycles, as described in Note 3a.
4. Route cable along dashboard with yellow locating tape at cable retainer and install in wiring conduit. Install three cable retaining clips.
5. Coil and tape excess cable behind armrest assembly.
6. Secure control and cable assembly to escutcheon with jamb nut.
7. Install and attach radio trim plate with second jamb nut.
8. Install sensitivity ring, felt washer and knob assembly and tighten set screw in knob assembly.
9. Install rug and right front and rear door sill plates.
10. Install right front kickpad.

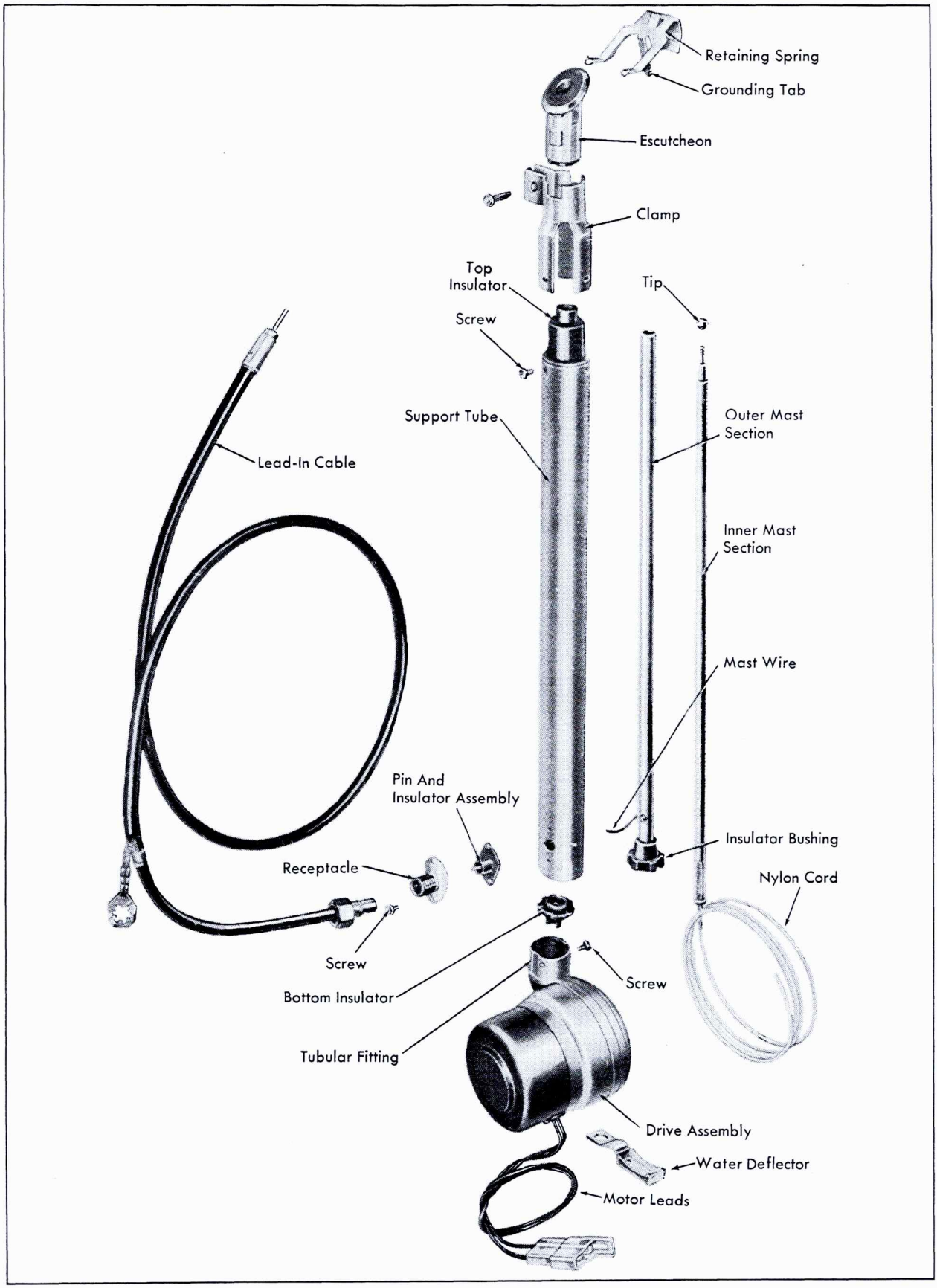


Fig. 15-7 Antenna Disassembled

11. Install instrument panel top cover as described in Section 12, Note 44b.
12. Install right armrest assembly with six attaching screws.
13. Install right quarter window garnish molding and secure with five screws.
14. Install rear seat back on mounting hooks and secure with two attaching screws.
15. Install rear seat cushion.

12. Antenna Unit

a. Removal

1. Lower antenna.
2. Disconnect negative battery cable at battery.
3. Disconnect motor leads at plastic connector and antenna lead-in cable from support tube.
4. Loosen clamp screw that holds antenna to escutcheon.
5. Remove bolt and washer holding antenna to right fender dustshield and remove antenna from car.
6. Escutcheon may be removed by removing retaining spring and pushing escutcheon out through top of fender.

b. Installation

1. Install escutcheon and retaining spring if previously removed.
2. Install antenna in position, being certain that antenna clamp is over grounding tab of escutcheon retaining spring.
3. Install bolt and washer that holds antenna assembly to right fender dustshield.
4. Connect lead-in cable to support tube.
5. Connect motor leads at plastic connector.
6. Tighten clamp screw that holds top of antenna to escutcheon.
7. Connect negative battery cable at battery.
8. Check operation of antenna.

13. Antenna Unit Disassembly and Assembly

a. Disassembly (Fig. 15-7)

1. Remove three screws securing clamp at top of support tube to support tube and remove clamp.
2. Remove two screws holding lead-in receptacle to support tube and remove receptacle.
3. Unsolder mast wire from pin and insulator assembly, and separate assembly from mast wire.

NOTE: Do not overheat pin by slow soldering because excessive heat will damage insulator.

4. Remove three screws securing support tube to drive assembly and remove support tube with top insulator attached by pulling it loose from drive assembly.
5. Remove outer mast section, with insulator bushing attached, from tubular fitting on drive assembly.
6. Inner mast section with cord attached can be detached from drive assembly by applying 12 volts to motor leads while grounding motor.

NOTE: Keep cord taut to prevent kinking or bending.

7. Remove bottom insulator from tubular fitting with the aid of a small drill inserted through each of the drain holes at bottom of tubular fitting.
8. Unscrew tip from inner telescopic section.

b. Assembly (Fig. 15-7)

1. Install tip on inner telescopic section.
2. Insert bottom insulator in tubular fitting with slotted protrusion down, aligning slots of insulator with ears in tubular fitting.
3. Insert cord through bottom insulator and into drive assembly as far as possible without applying force. Then apply 12 volts to the motor leads to retract cord into drive assembly. Be certain to keep cord taut to prevent kinking.
4. Place outer mast section over inner section, aligning slots of pin and insulator assembly with ears in tubular fitting.
5. Place support tube over mast assembly, aligning tang on tube with slot provided in tubular fitting. Pull mast wire through pin and insulator hole before securing support tube with three screws.
6. Insert mast wire into pin and insulator assembly, and solder.

NOTE: Be certain to use only resin type solder. Do not overheat.

7. Position lead-in receptacle over pin and insulator assembly and secure with two screws.
8. Install clamp over support tube and secure with three screws.

14. Antenna Unit Maintenance and Repair Procedure

Many antenna troubles can be prevented by cleaning and lightly oiling the antenna rod at periodic intervals. Cleaning is easily performed at oil change intervals, or when a car is being washed, by wiping the rod with a soft cloth.

NOTE: If car has been undercoated, check to make sure that drain holes have not been plugged.

a. Moisture in Cylinder

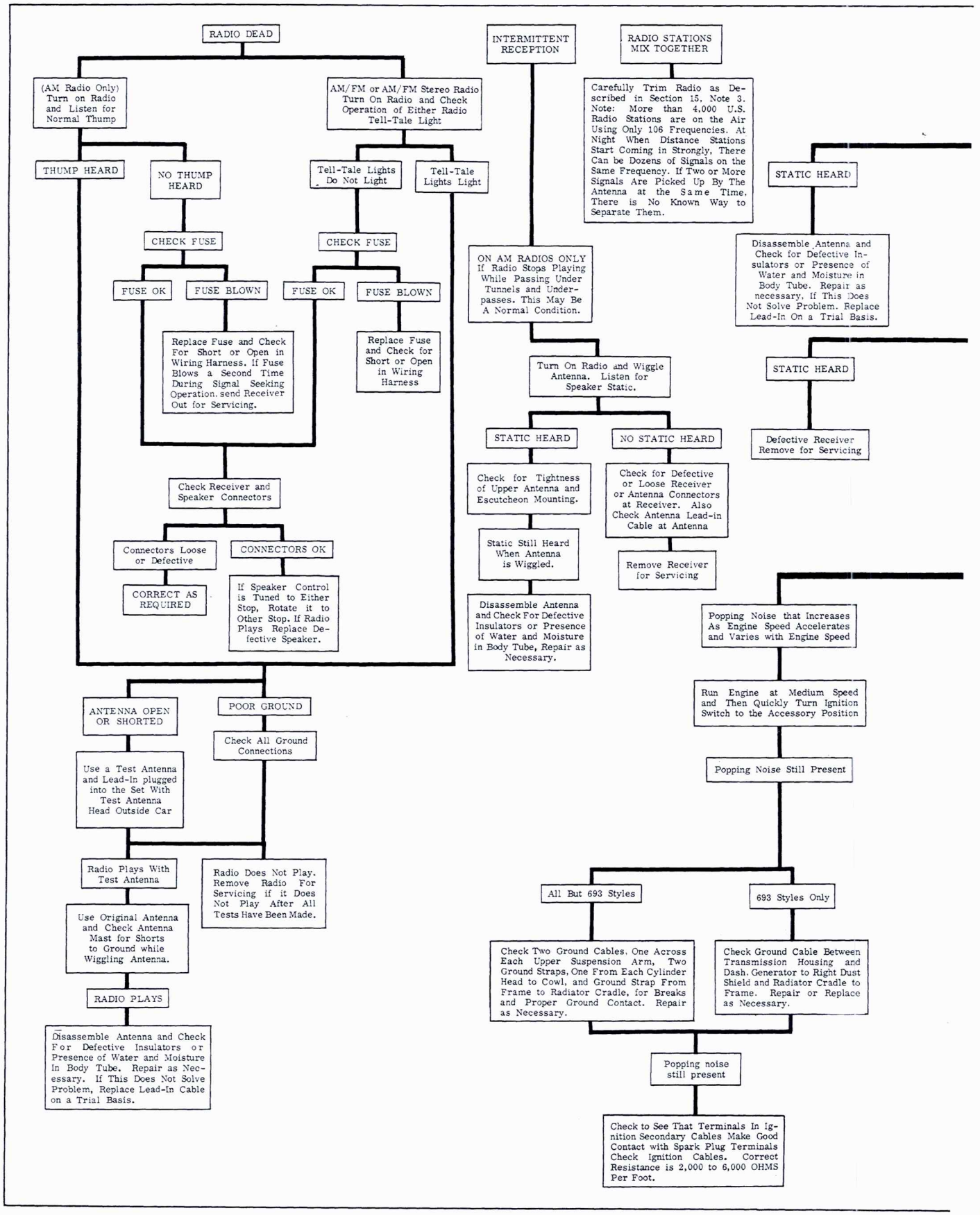
Weak reception or fading may be caused by moisture in the support tube, due to condensation or leakage through the insulating bushings. If

trouble has been traced to moisture in the tube, the antenna must be removed, disassembled and thoroughly cleaned. All moisture can be removed by blowing it out with compressed air, then pushing a clean, dry cloth through the support tube, as far as possible. Before assembling antenna, check drain holes in motor housing below body tube mounting point to be sure they are not obstructed.

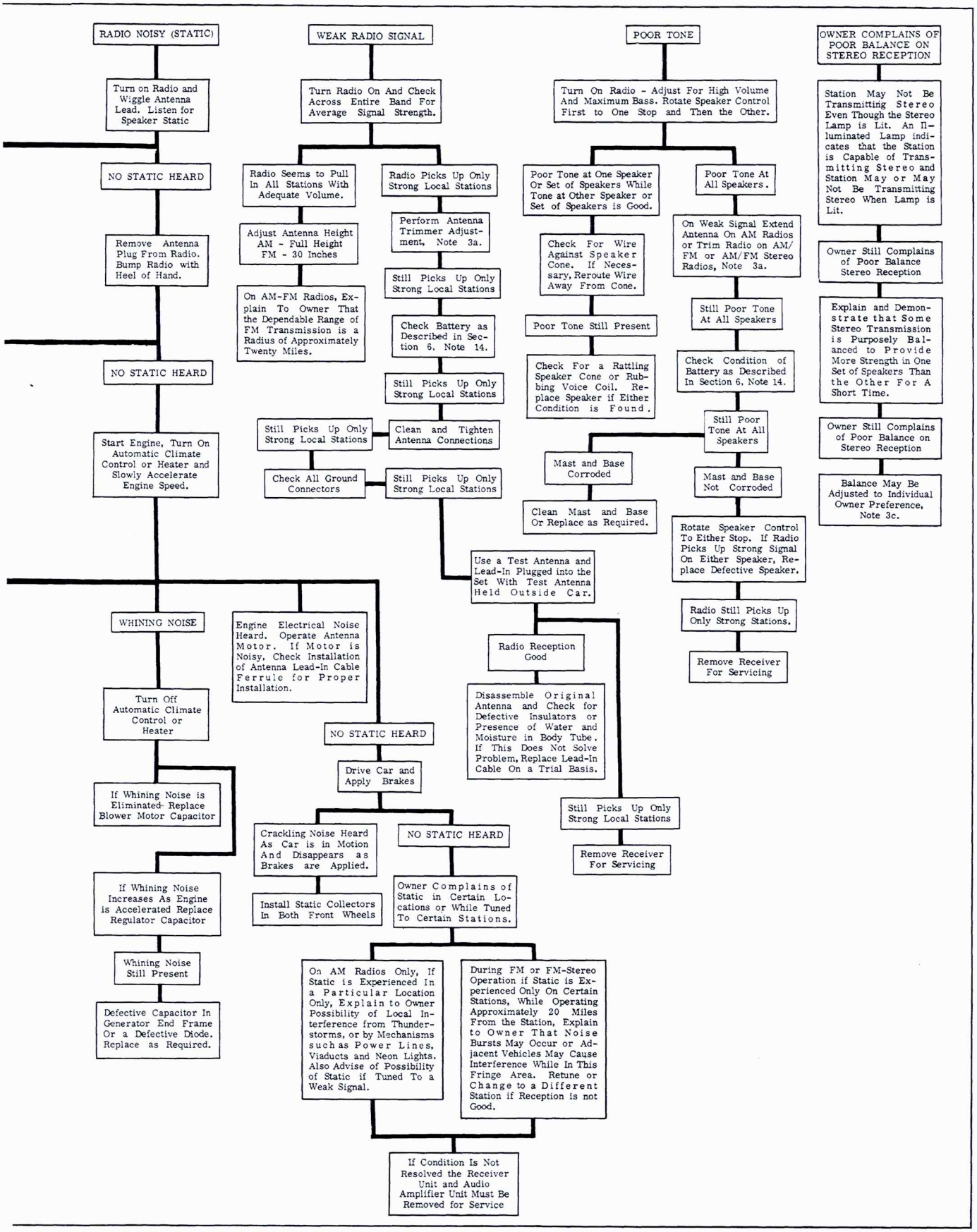
b. Antenna Will Not Raise or Lower

This condition can be due to a blown fuse, loose electrical connections at the switch on the receiver unit or at the antenna motor, a bent antenna mast or a loose or improperly positioned station selector knob. If a check of these causes fails to correct the condition, disassemble the antenna and replace any inoperative parts.

RADIO DIAGNOSIS CHART



RADIO DIAGNOSIS CHART



GENERAL DESCRIPTION

ELECTRIC CRUISE CONTROL

The Electric Cruise Control is a driver-operated speed regulating device that may be used either as a speed reminder or as an automatic speed control for any car speed between 25 and 85 mph. It is available on all 1969 Cadillac cars except the Fleetwood Eldorado. The Eldorado uses a vacuum Cruise Control unit explained later in this section.

The major components of the automatic lock-in Cruise Control are: the power unit, mounted on the left front fender dustshield; and the selector control assembly, located on the left side of the instrument panel bezel.

The power unit is driven by a flexible drive cable from the transmission. The drive cable also drives the speedometer cable that runs from the power unit to the speedometer. The selector control assembly is connected to the power unit by means of a bowden cable. Mechanical linkage connects the power unit to the accelerator and carburetor throttle rod.

The selector control assembly is shown in Fig. 15-8. Speed settings are secured by use of a calibrated thumb wheel. The selector dial is numbered with speed markings from 30 mph to 80 mph in increments of 5 mph. An arrow on the selector control assembly indicates the speed on the selector dial for which the unit is set when in the ON or AUTO position.

The switch lever turns the unit on and off, and activates the unit for automatic control. The switch lever is in the OFF position when all the way up; in the ON position when in the center; and in the AUTO position when pushed down to the end of its travel against spring tension.

The green lens behind the word "AUTO" lights up whenever the unit is set for automatic control.

When the switch is in the OFF position, the unit has no effect at any car speed. Once the switch has been moved to the ON position, the unit is on and accelerator back pressure will be felt as a warning at the speed for which the selector dial is set. Moving the switch lever momentarily to the AUTO position activates an automatic relay switch in the power unit and the green lens behind the word "AUTO" will light up, indicating that the unit is set for automatic control. The switch, which is spring loaded, will return to the ON position. Once the unit is set for automatic control, the unit will lock-in automatically whenever back pressure is felt on the accelerator pedal at the selected speed.

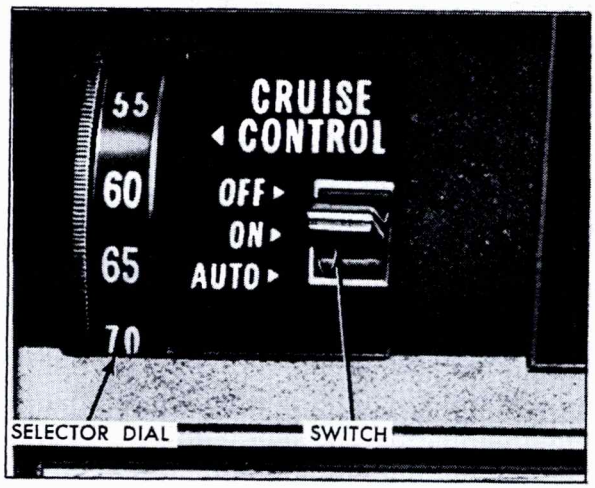


Fig. 15-8 Selecter Control Assembly (Exc. 693)

A reversible electric motor in the power unit actuates the mechanical linkage between the power unit and the carburetor. Motor feed points for forward and reverse energizing of the motor are closed and opened by a governor, under control of a governor spring that is compressed or relaxed to calibrated positions, corresponding to selected speeds, by a bowden cable leading to the selector control. The complete electrical circuit for the Cruise Control is shown in Fig. 15-9.

Speed Reminder Operation

Move the switch lever to "ON" position, and rotate the selector dial to the desired speed setting, with speed setting lined up with arrow on selector control assembly. The Cruise Control will then function as a speed reminder by exerting back pressure on the accelerator pedal whenever the speed setting is reached. The unit will function in the same way whenever the speed setting is changed.

Cruise Control does not interfere with normal acceleration up to the selected speed setting. Further acceleration may be obtained above that speed by pressing the accelerator pedal past the warning-back-pressure position.

Automatic Speed Control Operation

For automatic speed control, move switch lever down momentarily past spring tension to its stop, which is the AUTO position. The green lens behind the word "AUTO" will light up. Then rotate selector dial to the desired speed setting. The unit is now set for automatic control and will lock-in automatically when back pressure is felt on the accelerator at the selected speed. The car will now maintain the selected speed automatically and the driver may remove his foot from the accelerator pedal if desired. Selected speed will be maintained regardless of road terrain, within limits of engine performance.

When the unit is in automatic control, car speed can be changed by slowly rotating the selector dial upward to increase speed or downward to decrease speed. Also, car speed can be increased

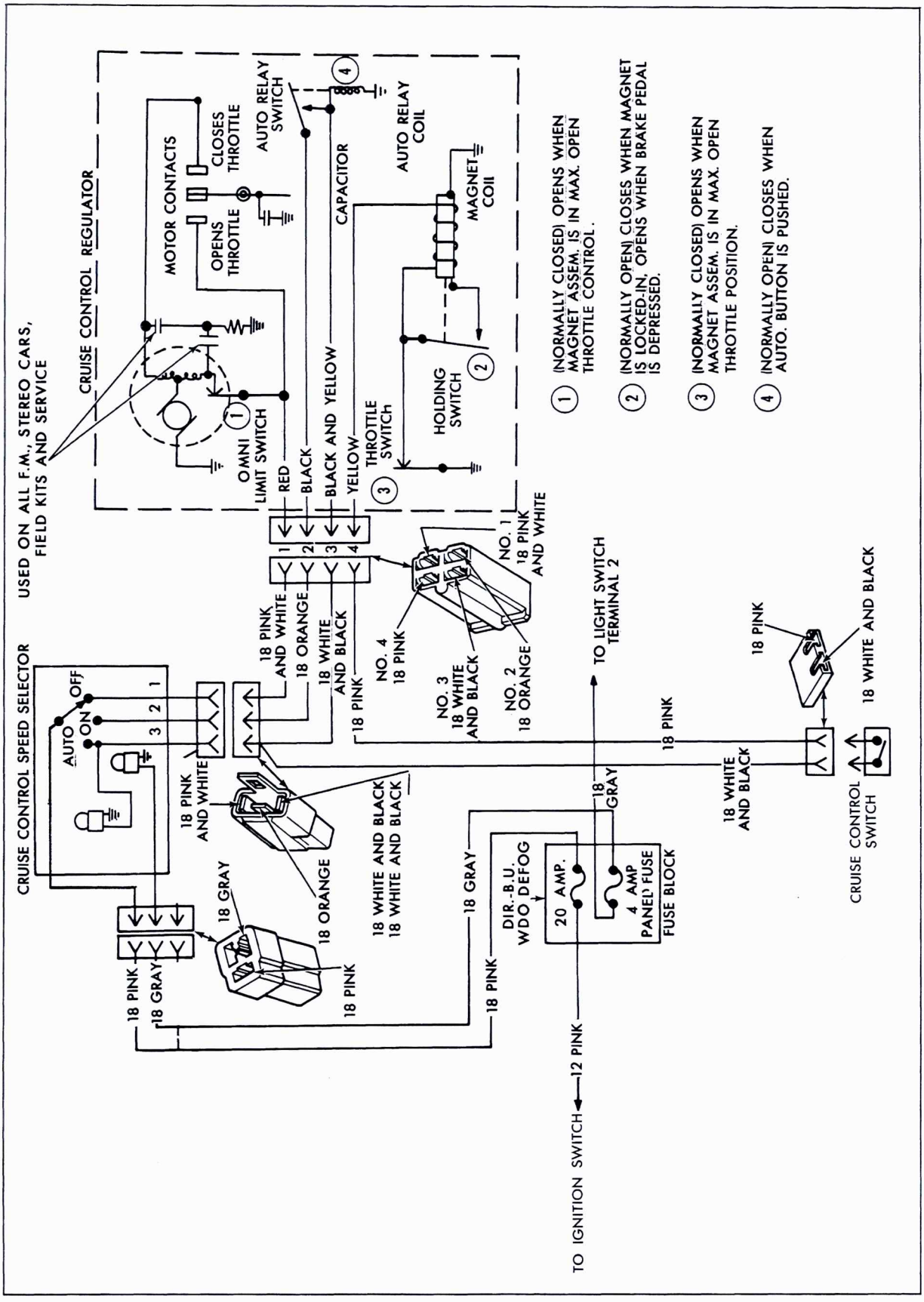


Fig. 15-9 Electric Cruise Control Wiring Diagram

at any time by pushing the accelerator pedal through the back pressure. When the accelerator is released, the car will return automatically to the selected speed.

CAUTION: When using selector dial to increase car speed during automatic control, always rotate dial slowly, to prevent sudden acceleration.

Automatic control is disengaged when the brake pedal is depressed. It can be re-engaged by simply accelerating until back pressure is felt. It is not necessary to push switch lever to AUTO position to re-engage automatic control. The AUTO setting can be cancelled by moving the switch lever to the OFF position, without touching the speed setting. This will unlock the unit and cancel speed reminder and automatic control.

Turning the ignition switch off will cancel all Cruise Control functions by stopping current flow at the ignition switch.

15. Cruise Control Preliminary Checks

It is not always necessary to remove and disassemble the power unit in cases of an inoperative Cruise Control. The following checks should be performed as part of your diagnosis to determine the cause and correction of Cruise Control trouble and to eliminate unnecessary service work on the power unit.

1. Turn ignition switch on. Do not start engine.
2. Push switch lever to AUTO position. The green lens behind the word "AUTO" should light up and stay lit after lever returns to ON (center position). If bulb does not light, check condition of directional signal fuse in fuse panel.
3. Disconnect multiple connector at Cruise Control power unit.
4. Push switch lever to OFF position.
5. Ground one test lamp lead and touch other lead to terminal No. 1 (pink with white stripe wire), Fig. 15-10. Lamp should light. If it does not light, wiring in selector control assembly, or assembly itself, is defective.
6. Ground one test lamp lead and touch other lead to terminal No. 2 (orange wire), Fig. 15-10, and push switch lever to ON (center) position. If lamp fails to light, check for defective wiring in selector control assembly.
7. Ground one test lamp lead and touch other lead to terminal No. 3 (white with black stripe wire), Fig. 15-10. Have a helper push switch lever to AUTO position and allow switch to come back to ON position. Test lamp and "AUTO" light should light when switch lever reaches AUTO position and then go out when switch lever returns to ON position. If test lamp fails to operate as described above, check for defective wiring in selector control assembly. If "AUTO" light does not light, check bulb, feed to bulb, and that a good contact is made at the ON terminal when switch lever is returning from AUTO to the ON (center) position.

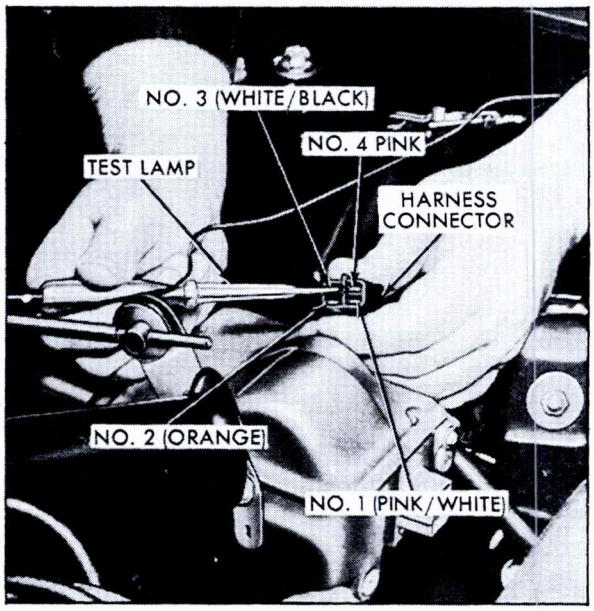


Fig. 15-10 Preliminary Electrical Checks

8. Ground one test lamp lead and touch other lead to terminal No. 4 (pink wire), Fig. 15-10. Have a helper push switch lever to AUTO position and manually hold switch lever in AUTO position. Depress brake pedal. Test lamp should go out and then come on when brake pedal is released. If lamp fails to operate as described above, check for improperly adjusted Cruise Control switch or defective wiring in selector control assembly. Allow switch lever to return to ON position.
9. Connect multiple connector to power unit.
10. Ground one test lamp lead and touch other lead to terminal No. 3 (white with black stripe wire) at power unit. Have a helper push switch lever to AUTO position and allow switch to come back to ON position. Test lamp should light when switch lever reaches AUTO position, and remain lit when switch lever returns to ON position. If test lamp fails to operate as described above, check for loose connections at relay switch or a defective relay switch.
11. Remove test lamp and turn ignition switch off.
12. Remove three screws securing power unit cover to power unit and remove cover.
13. Turn ignition switch on and momentarily move to AUTO position to set unit for automatic control. Do not start engine.
14. Move contact arm against motor feed point on locking arm side of magnet. Magnet assembly should move to closed throttle position and magnetically pick up locking arm. Then when contact arm is released, magnet should go to wide open throttle, taking locking arm with it. If magnet releases locking arm at wide open throttle, check holding switch on back of magnet assembly.
15. If magnet fails to pick up locking arm, check for improperly adjusted throttle switch, defective wiring in magnet circuit, or defective magnet coil.

16. Turn ignition switch off and move switch lever to OFF position.

17. Install cover on power unit and secure with three screws.

18. If the above electrical checks fail to correct the Cruise Control trouble, check the following adjustments before removing the power unit for service work:

a. Selector dial adjustment, Note 16.
b. Selector control cable check, Note 17.
c. Accelerator linkage adjustment, Note 19.
d. Motor feed points adjustment, Note 21.
e. Limit switch and throttle switch points adjustment, Note 22.

16. Selector Dial Adjustment

1. Rotate selector dial upward to high speed position against its stop.
2. Move switch lever to ON position.
3. Operate car at a steady speed of 50 mph, as indicated on speedometer.

CAUTION: This adjustment must be performed on highway. Do not perform on hoist or jack stands in shop area.

4. Rotate selector dial downward until back pressure is felt on accelerator pedal, then lock in Cruise Control by momentarily pushing switch lever to AUTO position.
5. With car speed at 50 mph, as indicated on speedometer, the numeral 50 on selector dial should be lined up with arrow on selector control assembly. Observe reading on dial, then move switch lever to OFF position. Do not rotate selector dial.
6. If reading on selector dial agrees with reading on speedometer, selector dial is properly adjusted.
7. If readings do not agree, adjust selector dial as follows:

a. With switch lever in OFF position, rotate selector dial either upward (if dial reading is on the low side) or downward (if dial reading is on the high side) against its stop. Then rotate dial by hand beyond its stop the necessary amount of travel as observed in step 5 to correct the selector dial setting. Slipping wheel will allow wheel to move past stop without damage.

b. Repeat adjustment procedure until reading on selector dial agrees with reading on speedometer.

17. Control Cable Check

1. Release retainer spring from dustshield by rotating 90 degrees. Pull control cable from dustshield to release from adjustable coupling.
2. Rotate selector dial to low speed position, until it is positioned against its stop, but do not force beyond its stop.
3. Position control cable as close to in-car position as possible, using No. 3 slot of Control Cable Gage, J-22650. End of hook should just touch stop on gage and legs of gage should bottom on ferrule. If adjustment is more than .005" off, adjust control cable as described in Note 18.

NOTE: Control cable must be positioned as illustrated, otherwise check will not be accurate as the relationship of the inner cable to the outer cable varies according to control cable location.

4. Rotate speed selector to high speed setting and install cable into dustshield until ferrule stops against dustshield. Hold in this position and rotate retainer spring on dustshield until it is positioned into slots.
5. Rotate selector dial to low speed stop to secure control cable into adjustable coupling.

CAUTION: This step must be performed or unit will control in "ON" position or lock-in in "AUTO" position at low speed regardless of selected setting.

18. Control Cable Adjustment

NOTE: The control cable is pre-set at the factory and normally should not require adjustment unless a new cable is installed. This adjustment must be performed off car. First check control cable as described in Note 17 and, if necessary, adjust as follows:

1. Remove Cruise Control Selector Assembly as outlined in Section 12, Note 80a.
2. Rotate selector dial to low speed position until it is positioned against its stop, but do not force beyond its stop.
3. Position assembly flat on workbench and make certain there are no kinks in cable.
4. Loosen hex head set screw at control cable clamp on selector control just enough so that

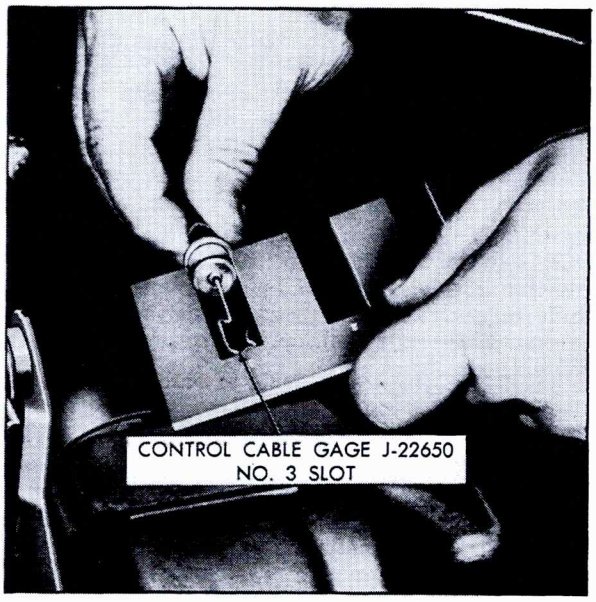


Fig. 15-11 Control Cable Check

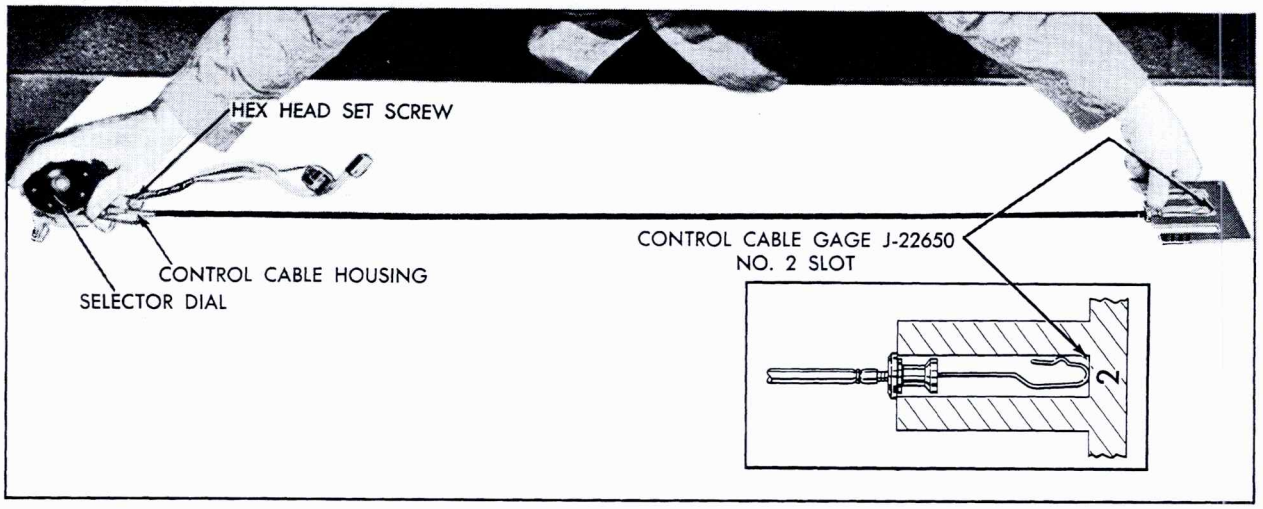


Fig. 15-12 Control Cable Adjustment

outer bowden cable casing may be threaded in and out of clamp by turning dustshield.

5. Thread control cable housing until it is approximately half-way out of control cable clamp. Position No. 2 center slot of Control Cable Gage, J-22650, so that end of hook touches stop on gage. Hold hook and gage in this position and thread toward selector control assembly until gage bottoms on ferrule of control cable. While holding in this position, tighten hex head set screw at control cable clamp, Fig. 15-12.

NOTE: Threading the outer casing will provide a more accurate adjustment and help retain the inner cable in the retainer.

6. Install Cruise Control Selector assembly as outlined in Section 12, Note 80b.

19. Linkage Adjustment

1. Adjust throttle rod as described in Section 6, Note 94.

2. Remove cotter pin securing accelerator linkage to exterior arm, then remove washer and separate linkage from exterior arm of power unit.

3. Adjust trunnion so that when trunnion is installed through exterior arm, locating hole in power unit housing will be aligned with locating hole in exterior arm. Throttle valves must be in lowest-idle-speed position.

NOTE: Due to the angle at which the trunnion enters this hole, it is necessary to move Cruise Control rod when inserting the trunnion. Repeat this operation until proper alignment is obtained. Be careful not to turn trunnion on Cruise Control rod too far forward, or throttle valves will unseat, causing an incorrect adjustment.

4. Insert 1/8" drill into hole of exterior arm and power unit housing to check alignment, Fig. 15-13.

5. Install washer on trunnion and secure trunnion to exterior arm with cotter pin.

6. Remove 1/8" drill used to align holes in exterior arm and power unit.

20. Cruise Control Switch Adjustment

1. Turn ignition on. Do not start engine.

2. Momentarily move selector switch to AUTO position until the green lens behind the word "AUTO" lights up.

3. Using a test lamp that is not self-powered, ground one test lamp lead and touch other lead to terminal #4 (pink harness wire) at power unit.

4. Loosen mounting screw securing switch to brake pedal mounting bracket.

5. Adjust switch so that lamp will light when brake pedal is fully released and will go out when brake pedal is depressed approximately 1/2 inch. Tighten switch mounting screw.

6. If switch cannot be adjusted, it is defective and should be replaced.

7. If necessary to install new switch, repeat step 5.

8. Remove test lamp, turn ignition switch off and selector switch off.

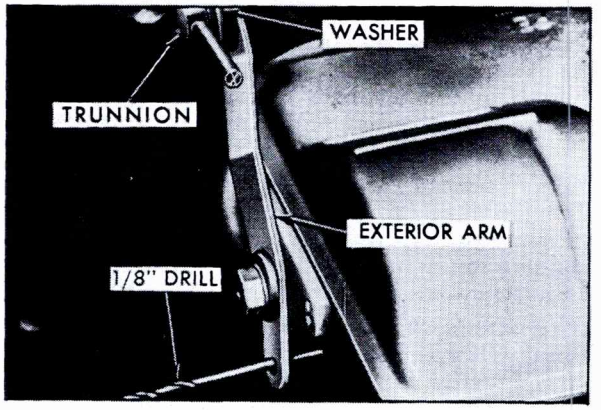


Fig. 15-13 Accelerator Linkage Adjustment

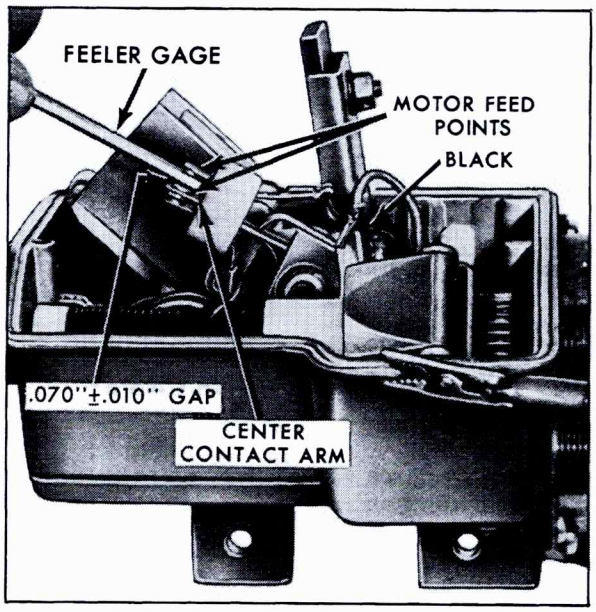


Fig. 15-14 Motor Feed Points Adjustment (Full Gap)

21. Motor Feed Points Adjustment (Full Gap)

1. If working on car, disconnect terminal board connector at power unit housing.
2. Remove three screws that secure cover to housing.
3. Connect negative lead of a 12-volt power source to housing.
4. Connect positive lead to close throttle motor feed point (black wire). Magnet assembly will move to close throttle position. Disconnect positive lead.
5. Measure gap between either motor feed point and center contact arm. This gap should be .070" ± .010", Fig. 15-14. Bend either motor feed point to adjust and recheck gap.

NOTE: A blackened condition of motor feed points does not mean they should be replaced. Points usually do not need replacement unless broken.

6. Rotate selector dial to high speed setting.
7. With ignition switch on, turn selector switch off. Then turn ignition switch off.
8. Use gray wire terminal to move contact arm up and down. Contact arm should move freely between both motor feed points without tension.
9. If contact arm does not move freely, bend tab, Fig. 15-15, to adjust. Bending the curved tab up will decrease tension holding contact arm toward bottom motor feed point (wide open throttle point); bending it down will decrease tension holding contact arm toward upper motor feed point (close throttle point).
10. Install cover on power unit and secure with three screws.

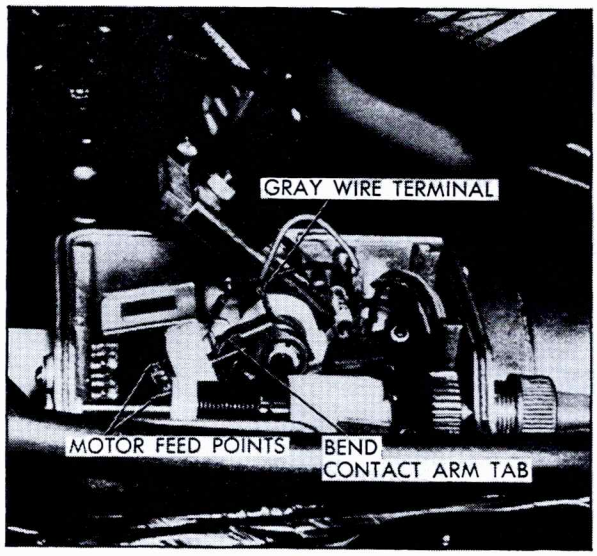


Fig. 15-15 Motor Feed Points Adjustment (Magnet to Locking Arm Gap)

22. Limit Switch and Throttle Switch Points Adjustment

NOTE: Adjusting the limit switch points will also adjust the throttle switch points.

1. If working on car, turn ignition switch to ON position but do not start engine; make sure selector switch is off.
2. Remove three screws that secure cover to housing and remove cover.
3. If working off car, connect the negative lead of a 12-volt power source to the power unit housing and connect the positive lead to the No. 1 terminal at the terminal board.

NOTE: Terminal board is numbered on inside with respective terminal numbers.

4. Loosen screw securing striker to housing and move striker up until motor runs. Then slowly move striker down until motor just stops running, and tighten screw. Measure distance from housing to top of striker, Fig. 15-16, using a "T" scale. Increase measurement 1/32" on "T" scale. Loosen screw securing striker to housing and adjust striker by placing "T" scale on housing and at top of striker, maintaining new dimension. Tighten screw.
5. If working off car, remove leads.
6. Install cover on housing and secure with three screws.
7. If working on car, turn ignition switch off.

23. Checking Motor Operation

1. Remove three screws securing power unit cover and remove cover.
2. Check accelerator linkage adjustment, as described in Note 19.
3. Turn ignition switch ON. Do not start engine.

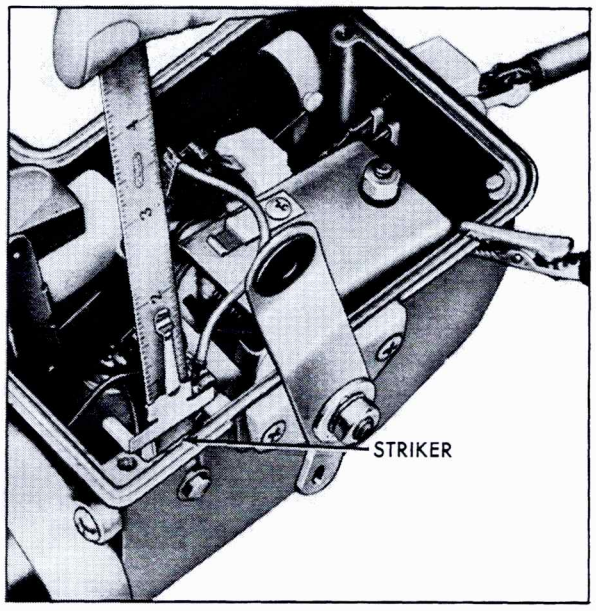


Fig. 15-16 Limit Switch and Throttle Switch Adjustment

4. Momentarily move switch lever to AUTO position to set unit for automatic control.

5. Move contact arm to touch motor feed point on locking arm side of magnet. Motor should rotate drive screw and move toward closed throttle position. Magnet will pick up locking arm magnetically. Motor should move magnet to wide open throttle position when contact arm is released.

6. If motor will not open or close throttle through accelerator linkage, motor may be binding. Check alignment of motor with housing. To check motor for binding, loosen motor from housing without disconnecting motor leads and disengage motor shaft from drive screw. Move contact arm against motor feed point on wide open throttle side of magnet assembly to check reverse operation, and against motor feed point on locking arm side of magnet assembly to check forward operation. If motor does not run free, replace motor. If motor does run free, current test motor as described in Note 24.

7. The drive screw or carburetor linkage may also be binding. After making certain motor runs free, check drive screw for binding by turning plastic gear on motor with finger to check for free rotation. If drive screw does not rotate freely, it is defective and should be replaced. If motor and drive screw operate satisfactorily, then adjust carburetor linkage.

8. Turn ignition switch OFF, move switch lever to OFF position, and reinstall power unit cover.

24. Motor Current Test

1. Disconnect multiple electric connector at power unit.

2. Remove three screws securing power unit cover to housing and remove cover.

3. Connect positive (red) lead of an ammeter tester to positive battery terminal.

4. Connect negative (black) lead of tester to terminal No. 2 on front of power unit.

5. Hold contact arm against upper motor feed point, and observe reading on ammeter. Hold contact arm against lower motor feed point and observe reading on ammeter. If either reading on ammeter indicates more than 4.5 amps, motor is drawing too much current and should be replaced.

6. Disconnect tester leads, install cover, and connect multiple connector.

25. Checking for Damaged Cables and Gears

1. Remove three screws that secure power unit cover to housing and remove cover.

2. Raise rear end of car and place on jack stands.

3. Start engine and move switch lever to off position.

4. Move transmission shift lever to either "Drive" range.

5. See if nylon speedometer gear is turning. This will determine if cable from transmission to power unit is turning and if gear is operating.

6. If nylon speedometer gear is turning and speedometer is not indicating, cable to speedometer is broken or speedometer is inoperative.

7. If nylon speedometer gear is not turning, disconnect transmission cable at power unit.

8. If cable is turning, gears are stripped inside power unit or plastic drive is stripped. Replace power unit.

9. If cable is not turning, check for a broken cable or stripped transmission speedometer drive gear.

10. Shut engine off and lower car.

11. Replace parts as required.

12. Install cover on housing and secure with three screws.

26. Selector Control Assembly

For removal and installation of the selector control assembly, refer to Section 12, Note 80.

27. Selector Control Assembly Disassembly and Assembly

a. Disassembly (Fig. 15-17)

1. Remove plastic lens over selector assembly. The lens snaps on and off.

2. Remove screw, flat washer, lock washer and wave washer and selector dial.

3. Remove screw and stop securing control cable and rack assembly to plate and housing assembly and remove control cable and rack assembly.

4. Cut plastic strap securing wiring to plate and housing assembly and remove two bulbs from hood assembly.

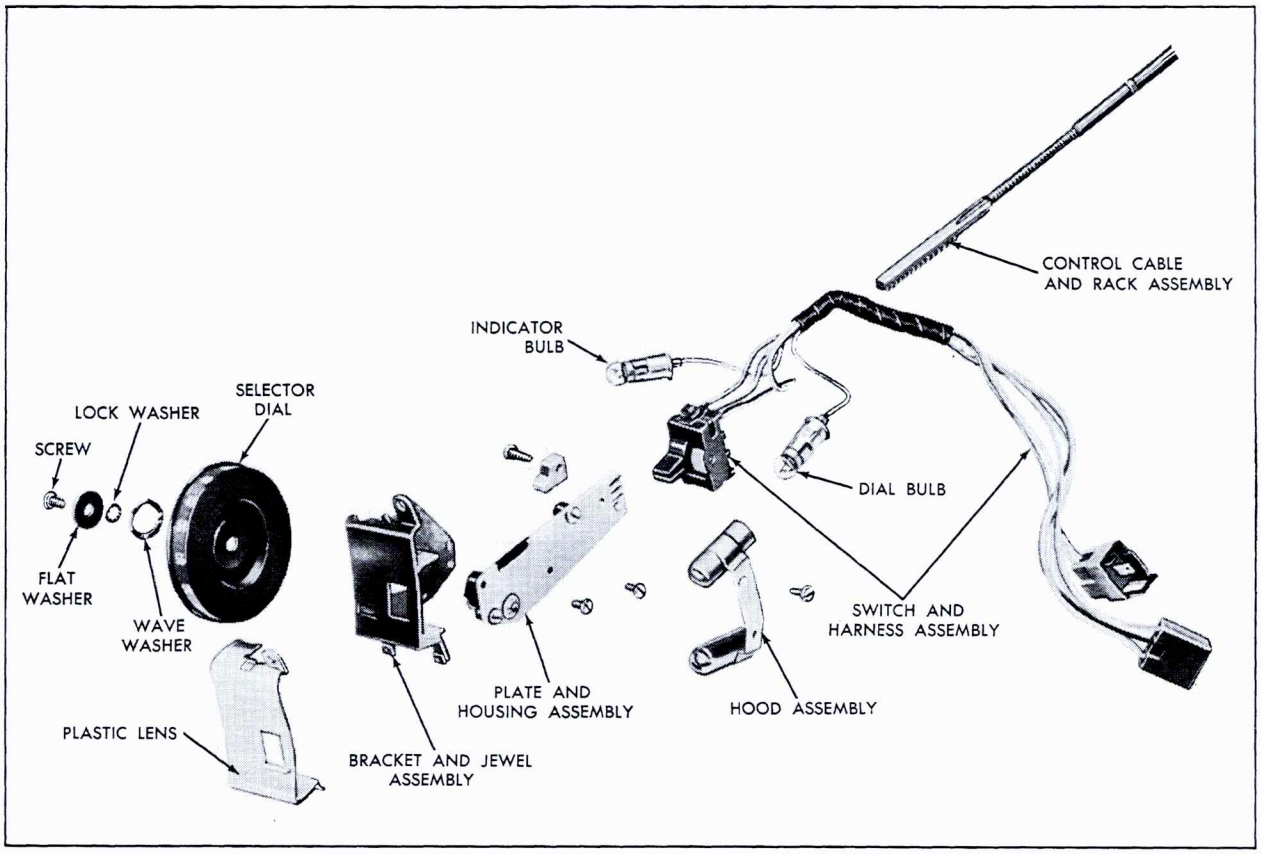


Fig. 15-17 Selector Control Disassembled (Exc. 693)

5. Depress two spring retainers on switch assembly and remove switch, wiring harness, and bulbs.

NOTE: The retainers are reached through two access holes -- one on top of the switch and one on the bottom.

6. Remove screw securing hood assembly to plate and housing assembly and remove hood assembly.

7. Remove two screws securing bracket and jewel assembly to plate and housing assembly and remove bracket and jewel assembly.

b. Installation

1. Position bracket and jewel assembly on plate and housing assembly and secure with two screws.
2. Position hood assembly on plate and housing assembly and secure with one screw.
3. Install switch assembly and two bulbs.
4. Using a new plastic strap, secure wiring harness to plate and housing assembly.
5. Install rack and cable assembly and secure with stop and screw.
6. Position selector dial on assembly and install wave washer, lock washer, flat washer, and screw.
7. Install plastic lens over selector assembly.
8. Adjust control cable as outlined in Note 18.

28. Power Unit

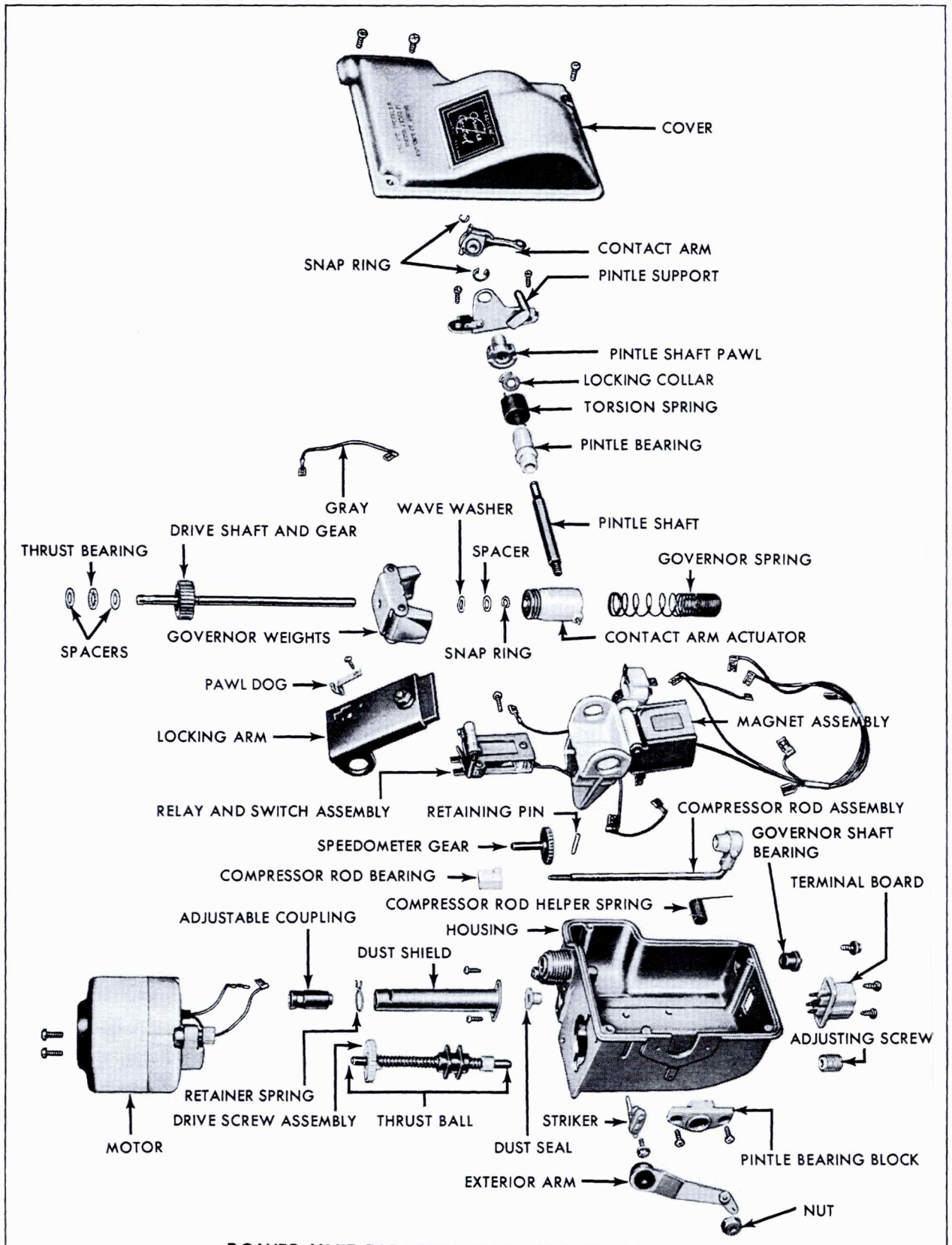
Whenever a power unit is removed, the car can be driven with the speedometer operating by removing the power unit cables from the speedometer and transmission, and installing a standard speedometer cable and housing assembly between the transmission and speedometer.

a. Removal

1. Disconnect multiple electric connector at power unit.
2. Disconnect drive cable and speedometer cable at power unit.
3. Rotate retainer spring and slide it back on control cable. Pull control cable to remove from power unit.
4. Remove cotter pin at exterior arm, and separate Cruise Control rod and washer from exterior arm.
5. Work inside left front wheel housing and remove three screws securing power unit mounting bracket to dustshield and remove power unit with bracket attached. Remove two screws securing bracket to power unit.

b. Installation

1. Secure power unit to mounting bracket with two screws. Position power unit and bracket on



POWER UNIT DISASSEMBLED CHART CC-1

Fig. 15-18 Power Unit Disassembled (Exc. 693)

left fender dustshield, working inside left front wheel housing, and secure with three screws.

2. Install Cruise Control rod and washer at exterior arm and secure with cotter pin.

3. Rotate speed selector to high speed setting.

4. Push control cable into dustshield and secure with retainer spring.

5. Rotate selector dial to low speed stop to secure control cable into adjustable coupling.

CAUTION: This step must be performed or unit will control in "ON" position or lock in "AUTO" position at low speed regardless of selected setting.

8. Connect drive cable and speedometer cable to power unit.

9. Connect multiple electric connector at power unit.

29. Power Unit Disassembly and Assembly (Fig. 15-18)

It is not necessary to disassemble and assemble the complete power unit to service individual components. Instructions on how to service the five following basic components are given: the magnet assembly, the motor, the drive screw assembly, the governor assembly and speedometer gear, and the compressor rod and dustshield.

a. Magnet Assembly Removal

1. Remove three screws that secure cover to housing and remove cover.

2. Using a 12-volt power source, attach negative lead to housing. Manually move contact arm to close throttle position and touch positive lead to terminal #2 on terminal board. This will move magnet assembly to close throttle position.

NOTE: Board is numbered inside by respective terminals.

3. Remove power source leads.

4. Remove red motor wire at lower inboard terminal of auto relay switch (capacitor side), Fig. 15-19.

5. Disconnect black motor wire at close throttle motor feed point, Fig. 15-19 and free wire.

6. Unhook compressor rod helper spring.

7. Remove nut, and exterior arm from pintle shaft.

8. Remove two screws securing pintle bearing block to housing and remove pintle bearing block.

9. Remove two screws holding pintle support to other side of housing.

10. Swing magnet assembly counterclockwise, as viewed from motor side, and free pin of contact arm actuator from contact arm.

11. Disconnect red, black, black with yellow stripe and yellow wires from terminal board and remove magnet assembly, Fig. 15-19.

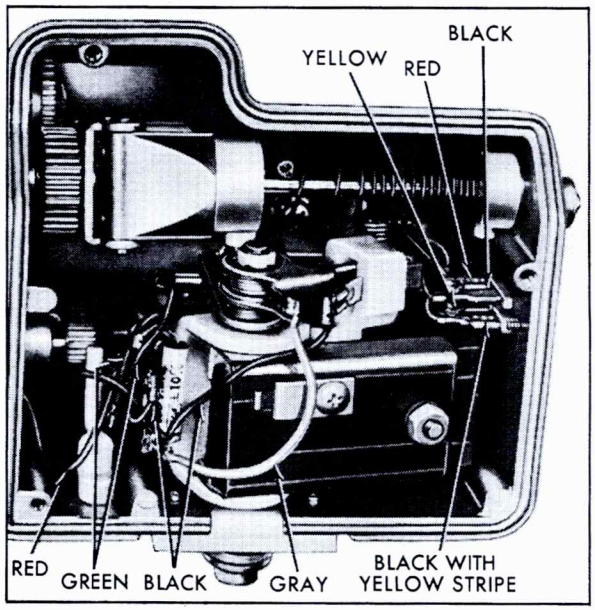


Fig. 15-19 Power Unit

b. Magnet Assembly Disassembly

NOTE: See Fig. 15-20 when performing steps 1-5.

1. Disconnect green wire at lower outboard terminal of auto relay switch (capacitor side) and at pintle support.

2. Disconnect gray wire from terminal on contact arm and at upper outboard terminal of auto relay switch (capacitor side) and remove wire.

3. Disconnect black wire at upper inboard terminal of auto relay switch (capacitor side).

4. Disconnect red wire from inboard terminal of auto relay switch (magnet side) and at open throttle motor feed point and free wire.

5. Disconnect black with white stripe wire at outboard terminal of auto relay switch (magnet side) and at holding switch.

6. Remove screw securing auto relay switch to magnet assembly and slide auto relay switch from pintle bracket.

7. Remove small snap ring from end of pintle shaft.

8. Remove larger snap ring from pintle shaft.

9. Mount magnet assembly in a vise. Position exterior arm on pintle shaft and take up torsion spring tension, Fig. 15-21. Hold in this position and remove screw securing pawl dog to locking arm. Remove pawl dog. Slowly release and then remove exterior arm.

10. Remove magnet assembly from vise.

11. Remove pintle shaft from magnet assembly, and catch contact arm. Remove pintle support.

12. Remove pintle bearing and torsion spring from magnet assembly.

13. Remove pintle shaft pawl, locking collar and locking arm from magnet assembly.

c. Magnet Assembly Assembly

1. Position locking arm on pintle bracket and

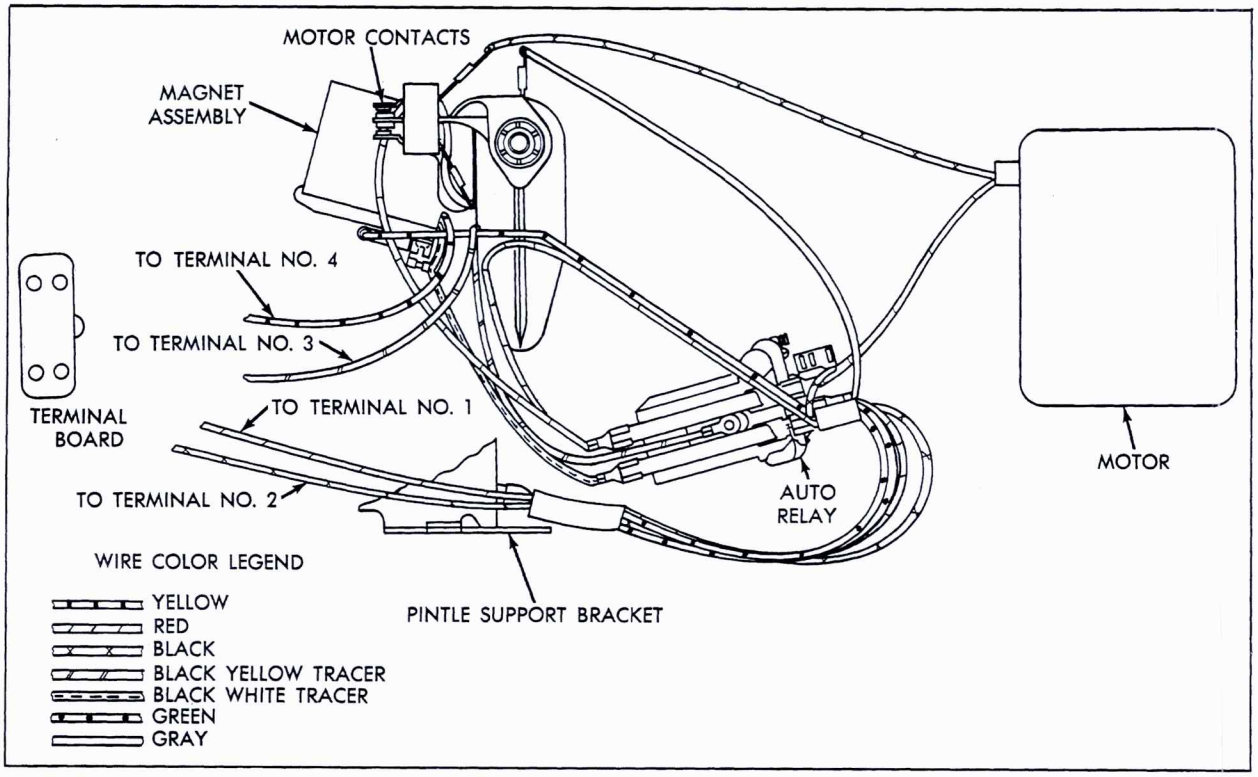


Fig. 15-20 Magnet Assembly

insert pintle shaft pawl, locking collar, torsion spring and pintle bearing, as shown in Fig. 15-22.

2. Position contact arm between points and insert pintle shaft into assembly.

3. Install large snap ring on inner groove of pintle shaft between contact arm and pintle shaft pawl.

4. Install small snap ring on end of pintle shaft.

5. Push contact arm side of pintle shaft toward magnet assembly.

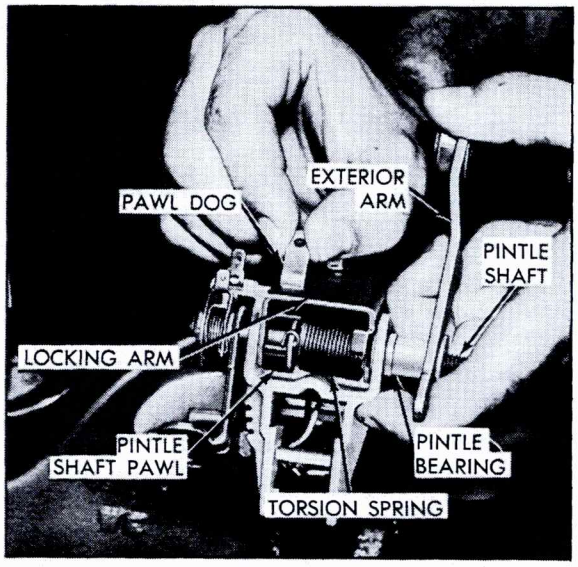


Fig. 15-21 Magnet Assembly Disassembly

6. Mount magnet assembly in a vise. Position exterior arm on pintle shaft and rotate exterior arm clockwise until pawl dog can engage notch in pintle shaft pawl. Install pawl dog and attaching screw, Fig. 15-21.

7. Slide auto relay switch on magnet assembly and secure with one screw.

NOTE: See Fig. 15-20 when performing steps 8-12. Wires must be routed exactly as illustrated.

8. Connect black with white stripe single lead at outboard terminal of auto relay switch (magnet side) and double lead at holding switch.

9. Connect double lead red wire at inboard terminal of auto relay switch (magnet side) and connect single lead at open throttle motor feed point so that red wire is positioned in slot on motor feed point housing.

10. Connect black wire at upper inboard terminal of auto relay switch (capacitor side) and position red wire in lower slot on pintle bracket and green wire in middle slot.

11. Connect gray wire at terminal on contact arm and at upper outboard terminal of auto relay switch (capacitor side).

12. Route green and red wires behind lower inboard terminal on auto relay switch (capacitor side) and connect single green wire terminal to lower outboard terminal. Connect double green wire lead to pintle support so that red and black wires are routed outside of pintle support.

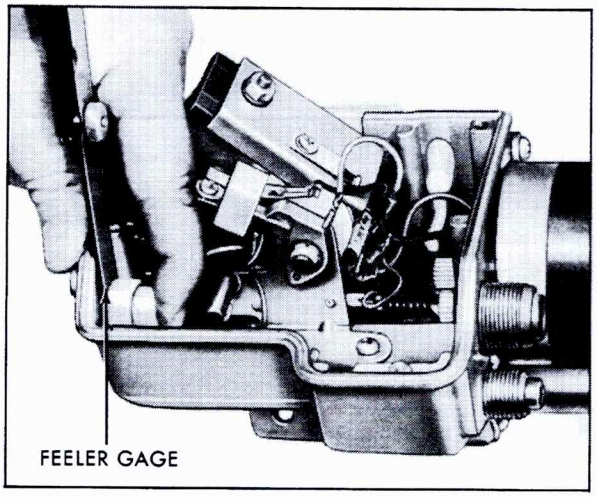


Fig. 15-23 Compressor Rod Adjustment

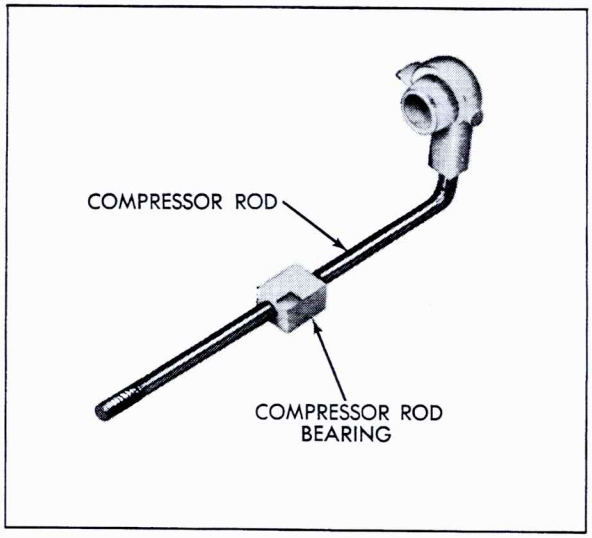


Fig. 15-24 Compressor Rod to Bearing Alignment

housing and slide off compressor rod bearing, Fig. 15-24.

I. Compressor Rod and Dust Shield Installation

1. Lubricate compressor rod with cam and bearing lubricant and slide compressor rod bearing on compressor rod with notch on inboard side, Fig. 15-24.

2. Install compressor rod in housing so that notch in compressor rod bearing is behind tang on pintle support. Tighten two screws that secure pintle support to housing.

3. Tighten two screws that secure pintle bearing block to housing.

4. Position compressor rod in housing so that a portion of rod extends from housing. Install dust seal on rod and position dust seal in housing.

5. With dust seal correctly positioned, install dustshield with two screws.

6. Insert adjustable coupling into dustshield and screw onto compressor rod.

7. Using a feeler gage, position compressor rod plastic cap with same gap between housing and cap as during removal and screw adjustable coupling on rod until same gap is obtained, Fig. 15-23.

NOTE: If gap measurement between housing and compressor rod cap at time of disassembly is not available, set gap at .110". When power unit is completely assembled, proceed as follows:

a. Install power unit in car as described in Note 28b.

b. Disconnect control cable from dustshield.

c. Road test car. Regardless of selector control speed setting, with switch in "AUTO" position and the green lens behind the word "AUTO" illuminated, car speed should be automatically controlled at 25 mph.

d. If speed is other than 25 mph, screw adjustable coupling in for more speed or out for less speed. One complete turn of adjustable coupling changes speed approximately 2-1/2 mph.

e. Repeat steps "c" and "d" until speed is automatically controlled at 25 mph as described in step "c".

8. Install compressor rod helper spring with shorter end against tang on pintle support and hook longer end under tab on plastic compressor rod cap.

9. With governor weights parallel with sides of housing, install governor assembly into housing by inserting spring end of governor drive shaft and gear into compressor rod plastic cap and hole in housing. Then install gear end of governor drive shaft and gear into governor shaft bushing engaging speedometer gear.

10. Insert pin on contact arm actuator into hole in contact arm by prying against contact arm with a screwdriver.

11. Install governor shaft bearing and secure with flatwasher and screw. Flatwasher must not ride on center ridge of bearing.

12. Perform motor feed points adjustment as outlined in Note 21.

13. Perform limit and throttle switch points adjustment as described in Note 22.

ELECTRIC CRUISE CONTROL DIAGNOSIS CHART

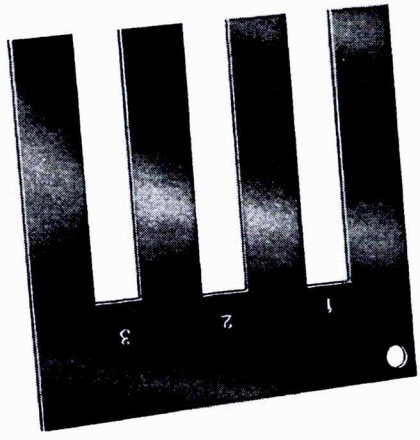
CONDITION	CAUSE	REMEDY
Speedometer noise.	Cables bent or kinked.	Straighten or replace cables. See Note 25.

ELECTRIC CRUISE CONTROL DIAGNOSIS CHART (Cont'd.)

CONDITION	CAUSE	REMEDY
Speedometer noise (cont'd.)	Lack of cable lubrication.	Lubricate.
	Noisy speedometer head assembly.	Repair.
Blowing fuses.	Short or ground in wiring circuit.	Perform electrical checks. See Note 15.
	Defective motor.	Check operation of motor. See Notes 23 and 24.
	Locked drive screw.	Check drive screw for binding. See Note 23.
No Cruise Control response.	Accelerator linkage broken or disconnected.	Connect or replace linkage and adjust, see Note 19.
	Drive cables broken or disconnected.	Connect or replace cables. See Note 25.
	Blown fuse.	Perform electrical checks. See Note 15.
	Loose connections or broken wires (internal or external).	Perform electrical checks. See Note 15.
No Automatic Control when unit is set for automatic lock-in.	Driver riding the brake pedal or driver does not accelerate to selected speed.	Instruct owner.
	No current at #2 terminal.	Perform electrical checks. See Note 15.
	Improper throttle switch adjustment.	Adjust limit and throttle switch. See Note 22.
	Improper Cruise Control switch adjustment.	Adjust Cruise Control switch. See Note 20.
Constant pressure on accelerator pedal regardless of dial setting.	Blown fuse.	Perform electrical checks. See Note 15.
	No current at #1 terminal.	Perform electrical checks. See Note 15.
	Control cable improperly adjusted.	Adjust control cable. See Note 18.
	Control cable defective.	Replace selector control cable.
	Inoperative motor or locked drive screw.	Check operation of motor and/or drive screw. See Note 23.
	Improper limit switch adjustment.	Adjust limit switch and throttle switch. See Note 22.
Automatic control engages at selected speed without unit set for automatic lock-in.	Shorted automatic relay switch (green auto light will be on).	Perform electrical checks. See Note 15.
	Improper Cruise Control switch adjustment or defective switch.	Adjust Cruise Control switch. See Note 20.
Unit remains operative in the "OFF" position.	Limit switch not properly adjusted.	Adjust limit switch and throttle switch. See Note 22.
Pulsating accelerator pedal.	Speedometer cable or drive cable kinked or lack of lubrication.	Lubricate or replace cables if necessary. See Note 25.

ELECTRIC CRUISE CONTROL DIAGNOSIS CHART (CONT'D)

CONDITION	CAUSE	REMEDY
Pulsating accelerator pedal. (cont'd.)	Improper accelerator linkage adjustment.	Adjust accelerator linkage. See Note 19.
	Improper motor feed points adjustment.	Adjust motor feed points. See Note 21.
Carburetor does not return to normal idle.	Improper carburetor or accelerator linkage adjustment.	Adjust throttle control rod and accelerator linkage. See Note 19.
	Weak or disconnected throttle return spring.	Connect or replace spring.
Unit does not control at selected speed.	Improper control cable adjustment.	Adjust control cable. See Note 18.
	Improper selector dial adjustment.	Adjust selector dial. See Note 16.
	Improper accelerator linkage adjustment.	Adjust accelerator linkage. See Note 19.
Unit controls in "ON" position or locks in "AUTO" position at low speed regardless of selected setting.	Control cable not secured to adjustable coupling.	Rotate selector dial to low speed stop to secure.
	Cable disengaged at selector control.	Engage cable.
Speedometer does not register.	Speedometer drive gear in transmission defective.	Replace gear.
	Broken drive cable from transmission to power unit.	Replace drive cable.
	Damaged drive gear or nylon gear in power unit.	Replace nylon gear or drive shaft and gear assembly.
	Broken speedometer cable.	Replace speedometer cable.



CONTROL CABLE GAGE J-22650

Fig. 15-25 Special Tool Cruise Control

GENERAL DESCRIPTION

VACUUM CRUISE CONTROL (ELDORADO ONLY)

The Vacuum Cruise Control is a speed control system which employs manifold vacuum to power the throttle servo unit. The servo moves the throttle when speed adjustment is necessary by receiving a varying amount of controlled vacuum from the transducer unit.

The speedometer cable from the transmission drives the transducer, and a cable from the transducer drives the speedometer. The operation of the transducer unit is controlled by an on-off switch on the dash and an engagement switch located at the end of the turn signal lever. Two systems for brake release are provided: an electric switch disengages the transducer unit and a vacuum valve vents the vacuum in the servo unit to atmosphere, quickly returning the throttle to idle position.

The operation of each unit of the system and the operation of the entire system under various circumstances is described below. Figure 15-26 shows the location of the system components within the vehicle.

COMPONENT OPERATION

30. Engagement Switch (Fig. 15-27)

This switch, located within the turn signal lever, has three positions. In the fully released position, the switch passes current through resistance wire to effect a "hold in" magnetic field in the transducer solenoid. This current is sufficient only to hold the solenoid in place once it has been actuated by the "pull in" circuit. Depressing the button partially allows current to flow to the transducer solenoid at full voltage which causes the solenoid to pull in. Depressing the button fully opens the circuit to both the resistance and standard solenoid feed wires and the solenoid becomes de-activated.

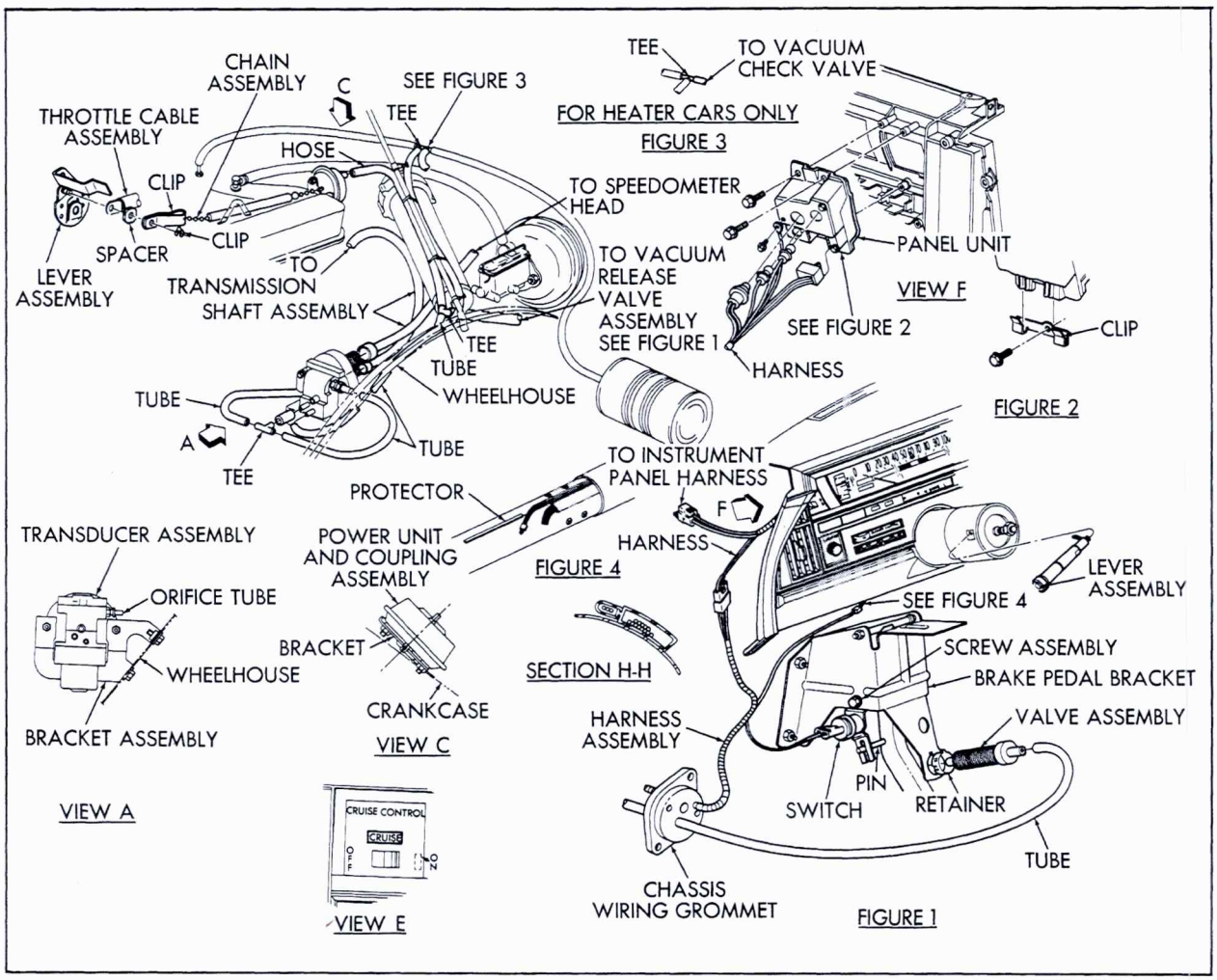


Fig. 15-26 General Arrangement - Vacuum Cruise Control

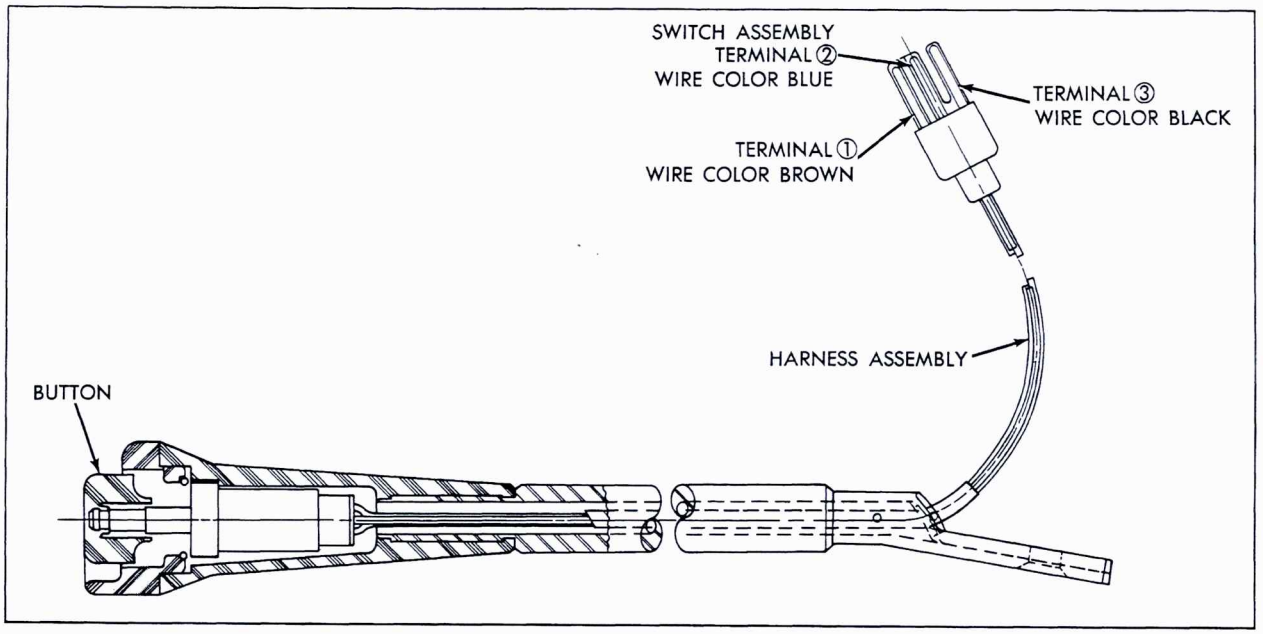


Fig. 15-27 Engagement Switch - Vacuum Cruise

During vehicle operation the three switch positions have the following functions:

a. Released

1. System not engaged: No function of the system will occur although a small current is flowing through the solenoid via the resistance wire.
2. System engaged: The small current flowing through the resistance wire is holding the solenoid in the engaged position.

b. Partially Depressed

Full voltage is applied to the solenoid (vehicle speed over 30 MPH) which sets the transducer to maintain the vehicle speed at the time of transducer engagement.

c. Fully Depressed

No electricity flows to the solenoid and the transducer is inactive. This position is used by the driver when he desires to raise or lower his controlled speed. He may accelerate to his new speed, press the button fully (transducer releases previously set speed) and release the button. Upon releasing the button, it passes through the partially depressed position and the solenoid is "pulled in", then into released position which provides "hold in" current. The driver may also press the button fully with no pressure on the accelerator pedal. In this case the transducer releases control of the throttle which returns to idle and the car slows. When the button is released the solenoid is pulled in and held in respectively and the transducer resumes speed control at the speed of the vehicle during the moment of button release (at vehicle speeds over 30 MPH).

31. On-Off Switch

This switch is located to the left side of the steering column on the instrument cluster. The toggle switch completely controls the electrical power to the Cruise Control system. When the switch is in the "OFF" position the system cannot be engaged. When the switch is in the "ON" position, the "ON" light is lit and the system may then be engaged with the switch located within the turn signal lever, at any speed above 30 MPH.

32. Brake Release Switches

Two brake release switches are employed in the Vacuum Cruise Control System. When the brake pedal is depressed, an electric release switch cuts off the voltage supplied to the engagement switch, hence cuts off power to the transducer unit. The transducer is then disengaged and requires engagement switch operation to return it to operation. A vacuum release valve operates with the electric release switch whenever the brake pedal is depressed. In case the electrical switch fails to operate, this switch opens a port to atmospheric pressure which rapidly bleeds down the vacuum in the servo unit thereby returning the throttle to the idle position.

33. Servo Unit

The servo unit is a vacuum actuated, variable position diaphragm assembly, which operates the carburetor throttle when the system is in operation. It is powered by controlled vacuum from the transducer and operates the throttle linkage via the bead chain The servo has a port on the

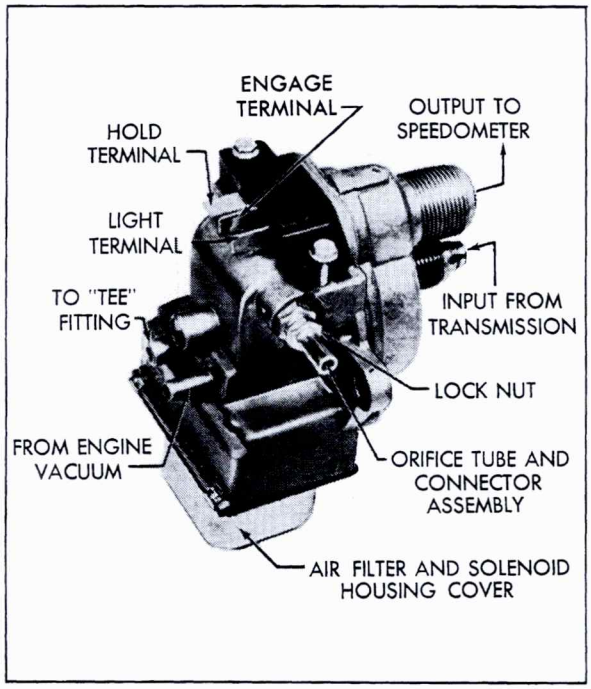


Fig. 15-28 Transducer - Vacuum Cruise

sealed side of the diaphragm housing. When controlled vacuum is applied to this port, atmospheric pressure moves the diaphragm which pulls on the bead chain opening the carburetor throttle.

34. Transducer

The transducer is a device which has two primary functions. First, it is a vacuum switch which, when engaged by the driver, supplies vacuum to a "Tee" fitting. Second, it meters a small variable quantity of air to the "Tee" fitting where it blends with vacuum, thus providing the servo unit with controlled vacuum which will maintain the selected speed. If the transducer begins to supply less bleed air (vehicle speed decreasing) the vacuum in the chamber increases and the diaphragm moves toward the vacuum port. If the transducer begins to supply more bleed air (vehicle speed increasing), the vacuum in the chamber drops and the diaphragm moves away from the vacuum port. In operation, at cruise speed, a proper balance of air and vacuum is blended at the "Tee" fitting and is imposed upon the servo unit to maintain an "on speed" cruise condition. See Fig. 15-28 and 15-29.

An additional function of the transducer is to drive the speedometer. Since the car speed is sensed by a speedometer-like mechanism within the unit, the speedometer cable from the transmission drives the transducer which drives a second cable (at a one-to-one ratio) to the speedometer.

The transducer is electrically engaged and disengaged through operation of the engagement

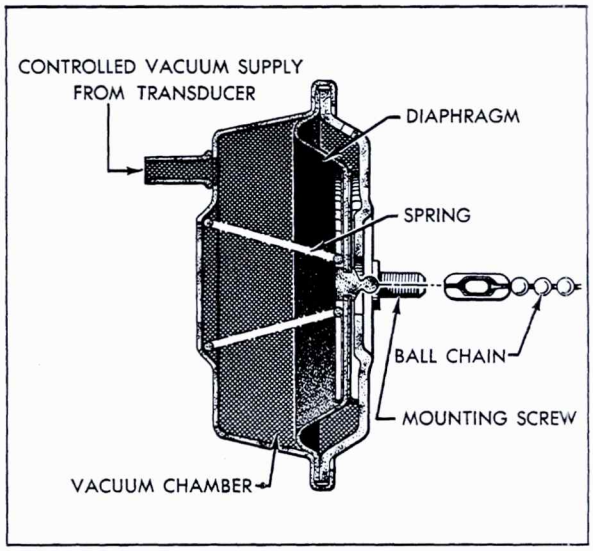


Fig. 15-29 Servo Unit - Vacuum Cruise

switch, on-off switch, and the electric brake release switch. It has two subassemblies which make up the unit: one being the magnetic speed sensing assembly and the other being the solenoid actuated vacuum switch, air bleed and filter, and low limit speed switch assembly. See Fig. 15-30.

a. Magnetic Speed Sensing Assembly

The speed sensing assembly operates in the same manner as a speedometer unit except that instead of rotating a needle through an angle proportional to the vehicle speed, it rotates a rubber drum which is clutched to the air bleed valve when the system is in operation. The assembly is driven by the speedometer cable from the transmission which turns a disk shaped ferrite magnet.

Facing the magnetic disk is the driven copper disk mounted on a shaft with the rubber drum mounted on the same shaft. A spiral hairspring connects the shaft to the housing and allows it to rotate through an angle which is proportional to car speed. If the car doubled its speed, the shaft would rotate to twice its previous angle as may be seen by noting the operation of a speedometer. The driven disk is sandwiched between the magnetic disk and a field plate. The field plate forms a returning path for the magnetic field from the magnetic disk.

The input shaft drives both the magnetic disk and the speedometer drive cable.

b. Vacuum Switch, Air Bleed and Filter, and Low Limit Speed Switch

The end of the shaft from the speed sensing assembly with the rubber drum extends into the air bleed metering assembly. This rubber drum has a tang extending from its surface which allows a set of points to close at a specific car speed. When the car reaches about 30 mph, the rubber

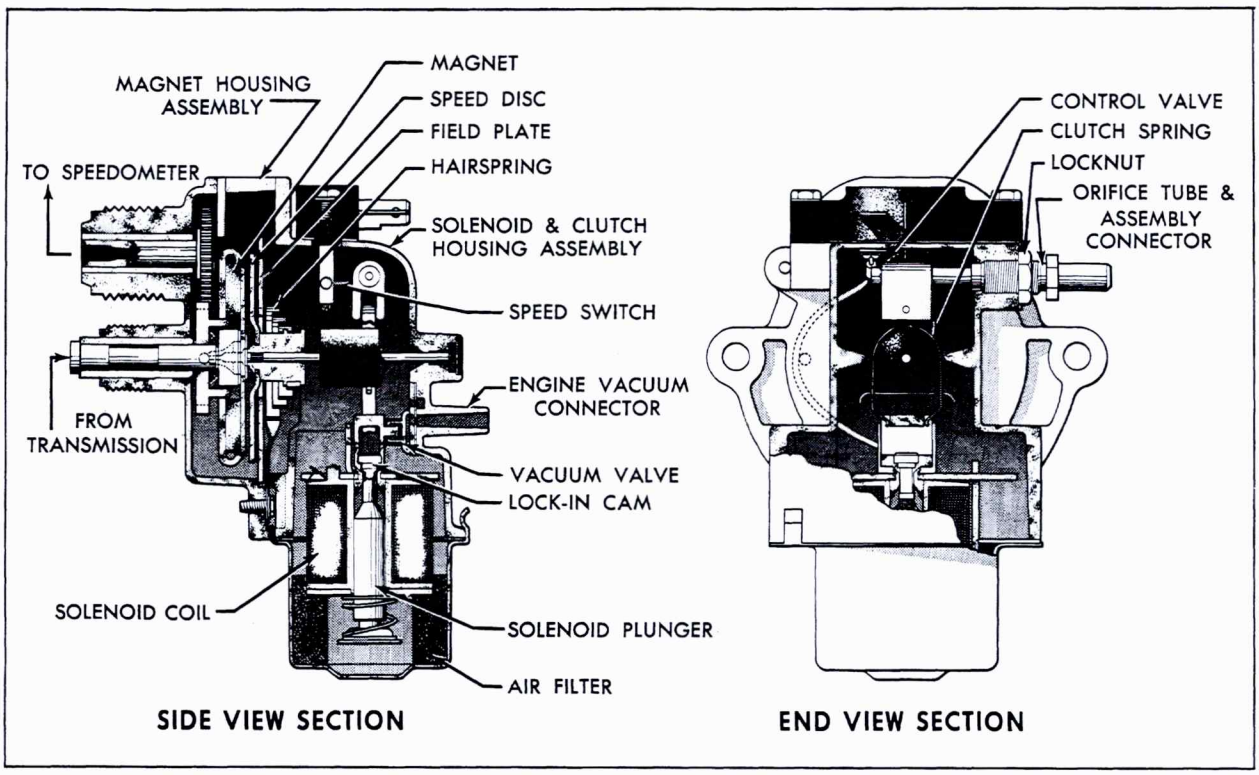


Fig. 15-30 Transducer - Cross Section

drum has rotated far enough (moved by the brass driven disk in the magnetic field) so that its tang has allowed a spring loaded electrical point to contact another point. These points are in series with the solenoid coil so that under 25 mph, no transducer operation is possible.

Surrounding the rubber drum is a "U" shaped spring clip which is held spread away from the drum by the nose or cam of the solenoid when the solenoid is in the relaxed position. The rubber drum and this clip comprise the speed clutch of the transducer. When the solenoid is energized, the solenoid nose moves toward the drum and releases the ends of the clip. The clip springs inward and attaches itself by friction to the drum. Now, any change in car speed will rotate the drum and move the "U" clip just as a speedometer moves its needle. The top of the "U" clip is attached to the air bleed valve. The clip moves a sleeve which slides on the orifice tube thereby covering and uncovering air ports in the wall of the tube (the tube inner end is plugged) whenever car speed changes from the speed at which the solenoid was energized. The direction of drum rotation is such that resulting bleed valve operation will cause the servo to decrease engine power if the car exceeds the preset speed and increase engine power if car speed decreases. The air which passes out the orifice tube enters the transducer through the openings in the solenoid housing, passes through the oil wetted polyurethane filter, and then enters the orifice tube ports.

When the solenoid is de-energized, the nose retracts and cams the ends of the "U" clip outward so that it releases the rubber drum.

The solenoid also operates a vacuum switch simultaneously with the clutching and declutching of the "U" clip. The solenoid operated vacuum valve slides over two ports in the transducer wall. One port is connected to manifold vacuum and the other is connected to a "Tee" fitting. When the solenoid is de-energized, the valve closes the manifold vacuum port and opens the "Tee" port to the inside of the transducer case. When the solenoid is energized, the valve connects manifold vacuum to the "Tee" fitting, at which point air is blended to the proper proportion and impressed upon the servo unit according to the dictates of the transducer.

During system operation the following events occur:

1. Car speed below 30 MPH--no function of the pull-in circuit because the rubber drum has not rotated far enough to close the solenoid points. No pull-in current can flow through the solenoid coil. The solenoid coil is receiving a small current via the 40 ohm resistance wire unless the brake pedal is depressed, engagement switch fully depressed, or the ignition switch is "off".
2. Car speed above 30 MPH-the tang on the rubber drum has closed the solenoid points. The pull-in circuit is now ready for engagement.
3. Driver partially depresses engagement switch--full current flows through the solenoid to pull it into operation. The solenoid cam tension

on the "U" clip is now released and the clip grips the rubber drum. Also the solenoid plunger completes the ground for the Cruise Control Cruise light. Simultaneously, the vacuum switch applys manifold vacuum to the "Tee" fitting. Here the vacuum is blended with air being introduced from the transducer. The balance of air and vacuum is impressed upon the servo to provide for initial throttle positioning.

4. Driver releases the engagement switch--current flows to the solenoid through the 40 ohm wire and since the solenoid is "pulled in", the reduced current flow is sufficient to hold it in position and the cruise light remains "on".

5. The car begins to ascend a hill--car speed drops slightly (very slightly) and the magnetic force on the driven disk of the speed sensor is decreased. The disk rotates slightly (as would a speedometer shaft because of hairspring tension) turning the rubber drum. Since the "U" clip is gripping the drum, it moves the air bleed valve in that direction which covers the air bleed ports more. With less air bleeding into the "Tee" fitting a higher vacuum level is achieved at the servo diaphragm, opening the throttle angle to correct for the underspeed condition.

6. The car begins to descend a hill--car speed increases slightly and the air bleed valve moves in that direction which uncovers the air bleed ports. With more air bleeding into the "Tee" fitting, a lower vacuum level is achieved at the servo diaphragm decreasing the throttle angle to correct for the overspeed condition.

7. Driver accelerates by pressing accelerator pedal--car speed increases and the system responds by moving the diaphragm to decrease throttle opening. Since a bead chain is used, the chain merely relaxes and has no effect on throttle operation. After the driver releases pressure from the pedal, the throttle will close until car speed decreases to the pre-set speed. At that point the transducer bleeds less air to the "Tee" fitting which opens the throttle enough to maintain the pre-set speed. The system returns to a stable condition.

8. Driver desires higher controlled speed, presses accelerator until new speed is reached, and depresses engagement switch fully and releases button--speed sensing assembly tries to turn in a direction that would decrease the throttle opening until the driver fully depresses the engagement switch. Then the current is cut off to the solenoid which retracts; the solenoid cam expands the "U" clip releasing its grip on the rubber drum and removes the ground from the cruise light. The drum and disk assembly then rotates to a new position because of the higher car speed. When the solenoid retracts, it also shuts off vacuum to the "Tee" fitting and opens the vacuum port to atmospheric pressure within the transducer thereby bleeding down the servo toward the relaxed position. As the driver releases the engagement switch, "pull-in" and "hold-in" of the solenoid occurs, respectively. The system is now engaged to maintain the car speed at the time of engagement switch release and the cruise light is "on".

9. Driver desires lower cruising speed, presses engagement switch fully, waits until car speed decreases to desired speed then releases switch --when the engagement switch is fully depressed the solenoid is de-energized causing the vacuum switch to bleed down the servo to idle throttle position and the "U" clip of the air bleed valve is released from the rubber drum. The drum and disc assembly is free to rotate to a position which corresponds to vehicle speed as the car slows. When the driver releases the engagement switch, the unit "pulls in" and "holds-in" in the normal manner. The air bleed valve is clutched to the rubber drum at the car speed corresponding to switch release. Vacuum is again applied to the "Tee" fitting and throttle control is assumed by the transducer to maintain the car speed at the time of switch release.

10. With system in operation, driver applies brakes--the electric release switch disengages the system first, then the vacuum valve operates. The Electric Release Switch cuts off power to the entire system, the solenoid is de-energized, the cruise light is de-energized, and the vacuum inside the transducer is vented to atmosphere. The vacuum valve will also vent the system if the brake pedal is depressed far enough. If the driver removes his foot from the brake pedal the electric switch again feeds voltage to the engagement switch and the vacuum switch seals the air bleed line. The unit will not re-engage since it receives only a small current through the 40 ohm resistance wire. If vehicle speed is below 30 MPH the system may not be re-engaged since the tang on the rubber drum has opened the low limit switch points in the transducer.

SERVICE INFORMATION

The components of the Vacuum Cruise Control system are designed to be replaced should they become inoperative.

The transducer is calibrated in such a manner during manufacturing that overhaul operations are impractical. However, one adjustment may be made to the transducer to correct speed drop or increase at the time of engagement.

35. Brake Release Switches

a. Electric

Service - An inoperative switch must be replaced. Whenever a new switch is installed it should be adjusted as described in the following step.

Adjustment - The brake switch must break the

electrical contact when the pedal is depressed 1/4-1/2 inch.

b. Vacuum

Service - An inoperative (sticking, plugged, or leaking) switch must be replaced. Switch replacement is similar to brake switch replacement. Be certain that the hose to the switch is connected firmly and is not cracked or deteriorated.

Adjustment - The vacuum valve should be pushed all the way into the retaining clip. Pulling the brake pedal up to the stop will automatically adjust valve.

36. Engagement Switch

a. Service

The engagement switch is serviced only by replacement.

b. Removal

1. Disconnect battery ground cable.
2. Pry the engagement button out of the turn signal knob with a small thin bladed screw driver.
3. With a small hook or long nosed pliers, remove the switch retaining ring.
4. Disconnect connector on lower end of column to provide slack in harness.
5. Remove steering wheel to gain access to turn signal lever attaching screw. Remove screw. Remove turn signal lever from turn signal housing utilizing the slack in the wiring harness.
6. Push slack into turn signal lever slot at base of lever (attachment end). This will force switch out of the other end of the lever.
7. With a small soldering iron, unsolder the wires and resolder them to the correct terminals of the replacement switch. Use only rosin core solder.

c. Installation

1. Once a new switch is installed, pull it back into the lever by pulling on the harness at the lever slot.
2. Reinstall retaining ring and button.
3. Push wire slack into turn signal housing; reinstall turn signal lever and steering wheel.
4. Connect connector on lower end of column.
5. Connect battery ground cable.

37. Servo

a. Service

If the servo unit is found to be defective, replacement is required. Note the condition of the hoses and replace any which are cracked or deteriorated.

b. Adjustment

No adjustment should be necessary to the bead chain if the proper chain has been installed.

38. Transducer

a. Maintenance

A defective transducer, that is one which is not simply out of adjustment, must be replaced. During replacement, check the hoses which connect to the transducer and replace any which are cracked or deteriorated.

b. Adjustment

One transducer adjustment is possible: Engagement - Cruising Speed Zeroing (to remove any difference between engagement and cruising speed).

NOTE: No transducer adjustment should be made, however, until the following items have been checked or serviced:

1. All hoses in good condition, properly attached, not leaking, not pinched or kinked.
2. Electric and vacuum release switches properly adjusted.

c. Engagement—Cruising Speed Zeroing

If the cruising speed is lower than the engagement speed, loosen the orifice tube locknut (see Fig. 15-28) and turn the tube outward; if higher, turn the tube inward. Each 1/4 turn will alter the engagement-cruising speed difference one mph. Tighten the locknut after adjustment and check the system operation at 60 MPH.

39. Electrical System Check Out (Fig. 15-31)

1. Check fuse and connector.
2. Check electric brake switch as follows: Unplug connector at switch. Connect ohmmeter at two terminals on brake switch. The ohmmeter must indicate infinity when the pedal is depressed and continuity when pedal is released. Replace electric brake switch if needed.
3. Check engagement switch and connecting wiring as follows: Unplug engagement switch connector (brown, blue, black) at electrical wiring harness connector and perform the following tests. (See Fig. 15-31).

a. Test #1 - Connect ohmmeter between terminal #1 (brown wire) and terminal #2 (blue wire). Continuity should be maintained until switch is depressed all the way in.

b. Test #2 - Connect ohmmeter between terminal #1 (brown wire) and terminal #3 (black). No continuity should be shown; however, when the

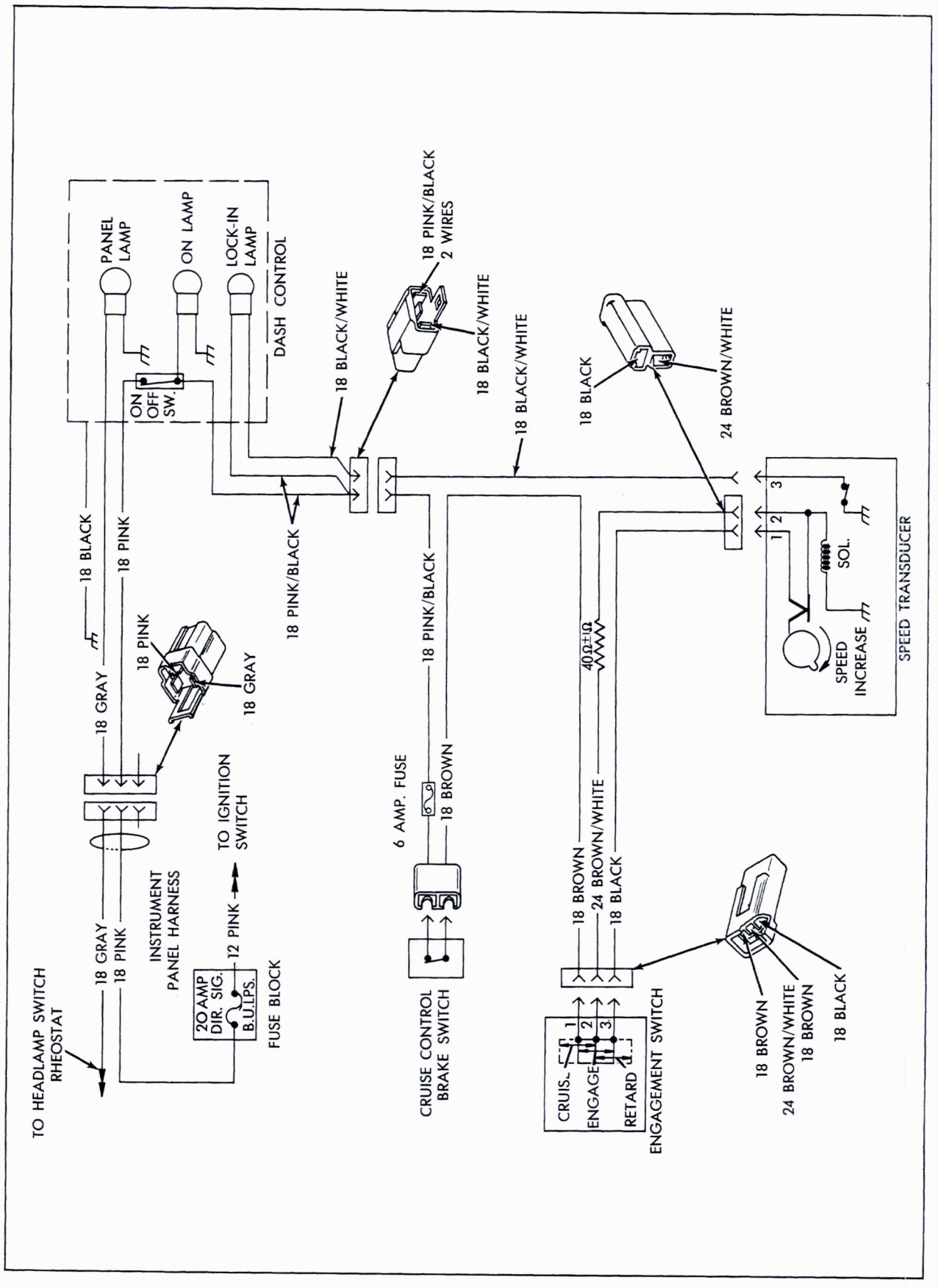


Fig. 15-31 Vacuum Cruise Control Electrical Diagram

button is depressed halfway, continuity should be indicated. When the button is pressed all the way down, no continuity should be shown.

c. Test #3 - Connect ohmmeter between terminal #2 (blue wire) and terminal #3 (black). Button released, no continuity; however, when the button is depressed partially and fully, continuity should be shown.

4. Disconnect engage switch wire harness connector from the main harness connector (brown, brown/white, and black wires). Connect ohmmeter between brown/white stripe wire in main wire harness and ground. Make sure the transducer is well grounded to the chassis. The ohmmeter should read between 42 and 49 ohms. If a resistance either above or below the value indicated is shown, then disconnect the connector from the transducer and measure the resistance of the brown/white stripe wire. It should measure 40 ohms ± 2 ohms. If a resistance either above or below the value indicated is shown, the main wiring harness should be replaced.

NOTE: When disconnecting or reconnecting the main wiring harness connector from the transducer, care should be exercised so as not to damage the blade connectors or the wiring harness. The disconnect may be facilitated by prying carefully on the plastic connector with a small blade screw driver.

When measuring the solenoid coil circuit resistance between the hold terminal and ground, the ideal ohmic resistance should be between 5 and 6 ohms. A reading of less than 4 ohms indicates shorting in the coil circuit. A reading of more than 7 ohms indicates excessive resistance in the coil circuit. Either extremity indicates replacement of the transducer assembly. The black main harness wiring from the switch to the transducer should also be checked for continuity.

BUTTON POSITION	TERMINALS		
	1 to 2	1 to 3	2 to 3
Cruise (released	closed	open	open
Engage (partially depressed)	closed	closed	closed
Trim (fully depressed)	open	open	closed

5. To check the cruise light circuit, first check bulb. If found satisfactory, refer to electrical schematic and proceed as follows: (a) Turn ignition switch and cruise control switch on. (b) Connect a voltmeter between light terminal connector on transducer and ground. (c) If battery voltage is present at this test point, transducer replacement is indicated. If no voltage is present, check cruise light wiring and or connections.

40. Servo and Vacuum Check Out (Fig. 15-32)

To determine the condition of the diaphragm, remove hose from servo unit and apply 14 inches of vacuum to the tube opening and hold in for one minute. The vaccum should not leak down more than 5 inches of vacuum in one minute. If leakage is detected, replace servo. To utilize engine as a vacuum source, proceed as follows:

1. DISCONNECT SERVO BEAD CHAIN and hose from servo then connect engine vacuum directly to the servo fitting.
2. Note position of servo diaphragm.
3. Start engine - the diaphragm should pull in.
4. Clamp off engine vacuum supply line and check for leakage.

The cruise release brake switch (vacuum) and connecting hoses can likewise be checked using a vacuum pump.

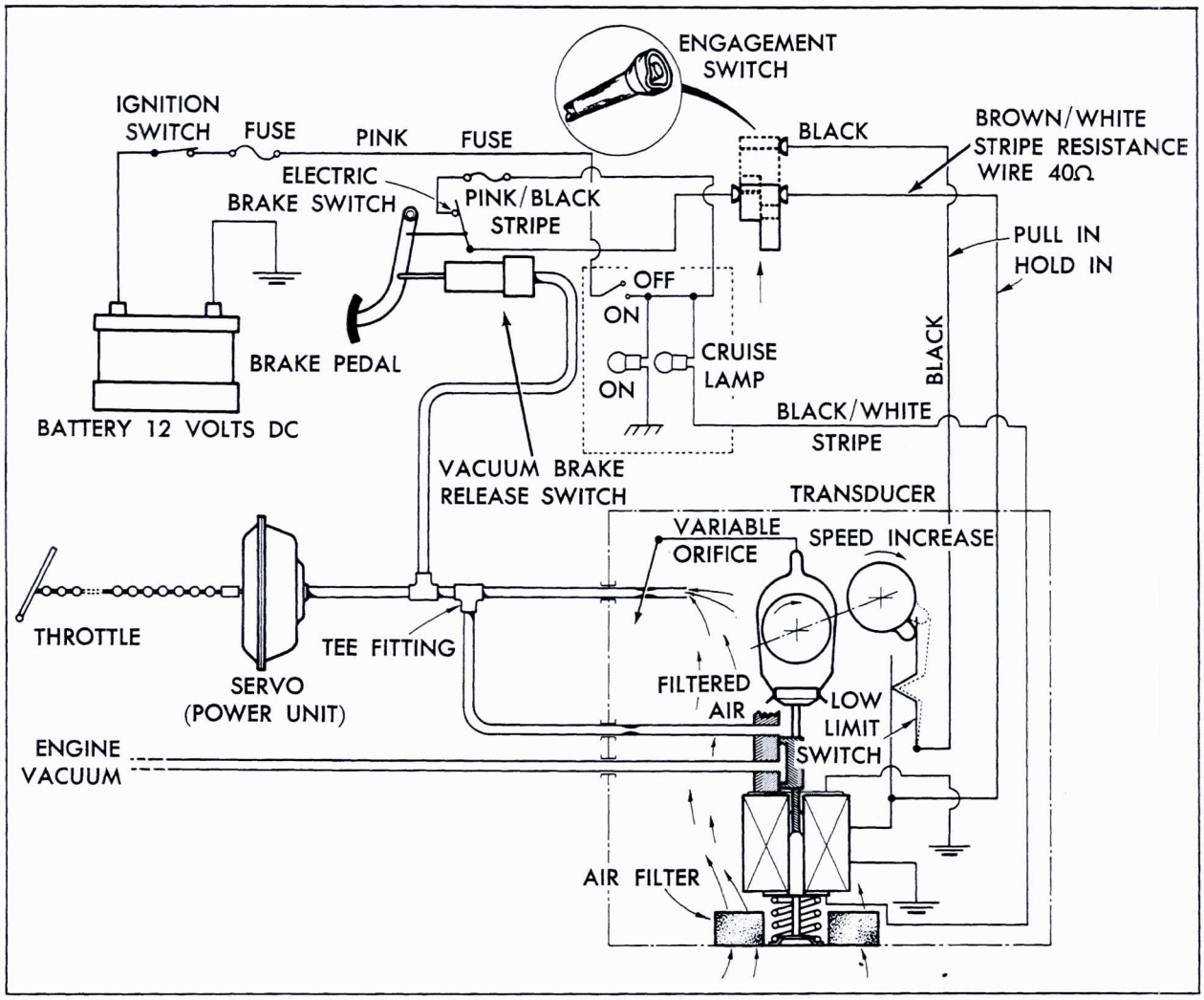


Fig. 15-32 Vacuum & Electrical Diagram

VACUUM CRUISE CONTROL DIAGNOSIS CHART

CONDITION	CAUSE	CORRECTION
Will not engage - System Inoperative.	On-Off switch "off".	Turn to "on" position.
	Brake switch circuit open.	Check connections - adjust or replace switch. Refer to Electrical Check Out.
	Fuse blown.	Replace fuse - if it blows again, check for: 1. Engage switch stuck in the center of travel - Refer to Electrical Check Out. 2. Incorrect wiring - Refer to Electrical Check Out. 3. Short to ground - Refer to Electrical Check Out. Make necessary corrections.
	Defective engage switch.	Replace as needed - Refer to Electrical Check Out.
	Vacuum leak in servo and/or brake switch and connecting lines. Vacuum hose not connected to vacuum switch.	Vacuum test and repair or replace as needed refer to servo and Vacuum System Check Out.
	Vacuum release switch misadjusted (always open).	Readjust switch.
	Crossed hoses at transducer.	Reroute hoses.
	Pinched or plugged hose that is connected to the servo.	Free or replace hose.
	Open in wiring harness.	Repair or replace as needed.
	Defective transducer.	Replace transducer.
Does not cruise at engagement speed.	Orifice tube misadjusted.	Adjust as required.
System hunts, pulses, or surges.	Bead chain loose.	Tighten bead chain.
	Kinked or deteriorated hoses (air leak).	Repair or replace.
	Defective and/or improperly positioned drive cables and/or casing assemblies.	Repair or replace as needed.
	Defective transducer.	Replace transducer.
System does not disengage - with brake pedal.	Brake and/or vacuum switch - misadjusted or defective.	Adjust or replace as required. Refer to servo and Vacuum System Check Out and Electrical Check Out.
	Red wires (which should be connected to the pedal switch(es) connected to the fuse block.	Reroute wires to stoplight switch.

VACUUM CRUISE CONTROL DIAGNOSIS CHART (CONT'D)

CONDITION	CAUSE	CORRECTION
System steadily accelerates or applies full throttle when engaged.	Manifold vacuum connected directly to servo. Defective transducer.	Reroute hose. Replace transducer.
Cannot adjust speed downward with engage button.	Defective engagement switch or wiring.	Replace as needed. Refer to Electrical Check Out.
Does not engage or engages lower than limits referred to in "Driver Operation"	Defective transducer.	Replace transducer.
Slow throttle return to idle after brake is depressed.	Pinched air hose at vacuum release switch.	Free or replace hose.
System operates correctly, but constant vacuum bleed when system is disengaged.	Crossed vacuum hoses at transducer.	Reroute hoses.
High engine idle speed - independent of carburetor adjustments. Constant air bleed through system.	Tight servo chain.	Loosen chain adjustment.
Constant drain on battery.	Power lead connected to "Fused Battery" terminal on fuse block.	Reroute to "Fused IGN" terminal.
System can be engaged at idle by depressing switch, but will drop out when switch is released. Solenoid can be heard when switch is depressed when the vehicle is standing still.	Wires reversed at transducer.	Reverse wires - See Fig. 15-31.
On light will not turn on even though system cruises satisfactory.	Defective bulb.	Replace.
Cruise light will not turn on even though system cruises satisfactory.	Defective bulb or defective ground circuit in transducer.	Replace bulb or replace transducer.

GENERAL DESCRIPTION
GUIDE-MATIC

The Guide-Matic is a semi-automatic electronic device that controls the high and low beams of the car headlights in response to light from an approaching car. It is available as optional equipment on all 1969 Cadillac cars.

The Guide-Matic consists of five major components: a photo-amplifier unit, a power relay, a foot switch, a sensitivity control, and an interconnecting wire harness, Fig. 15-33.

The photo-amplifier unit combines a light sensing optical device and electronic amplifier into one unit with sufficient power to operate a power relay for switching headlight beams.

The unit is mounted below the radiator cradle tie bar just to the left of center of the car.

Light from approaching headlights is picked up by the lens. A level assembly for use in setting correct vertical aim is attached as part of the unit. A serial number label, Fig. 0-1, is attached to the rear of the unit.

The unit is adjusted for sensitivity at the factory and then completely sealed by filling the interior of the metal case with a moistureproof epoxy material. The epoxy forms a capsule around all the interior parts and prohibits access to factory sensitivity adjustments or other interior parts. If a failure occurs, the entire unit must be replaced.

The power relay switches the headlight beams in response to the signal from the photo-amplifier unit. It is mounted on the toe pan just above the headlight dimmer switch (below carpet and jute).

The foot switch is a special dimmer-override type that provides either "automatic" or "low beam" control of the headlights. It also contains an override section for obtaining an overriding high beam when in "automatic" low beam position, if required.

The override section functions as follows: with the foot switch in "Automatic" position, a slight downward pressure on top of the switch provides high beam regardless of the amount of light on the photo-amplifier unit. This arrangement permits signaling an approaching driver if he fails to switch to low beam and also provides a simple

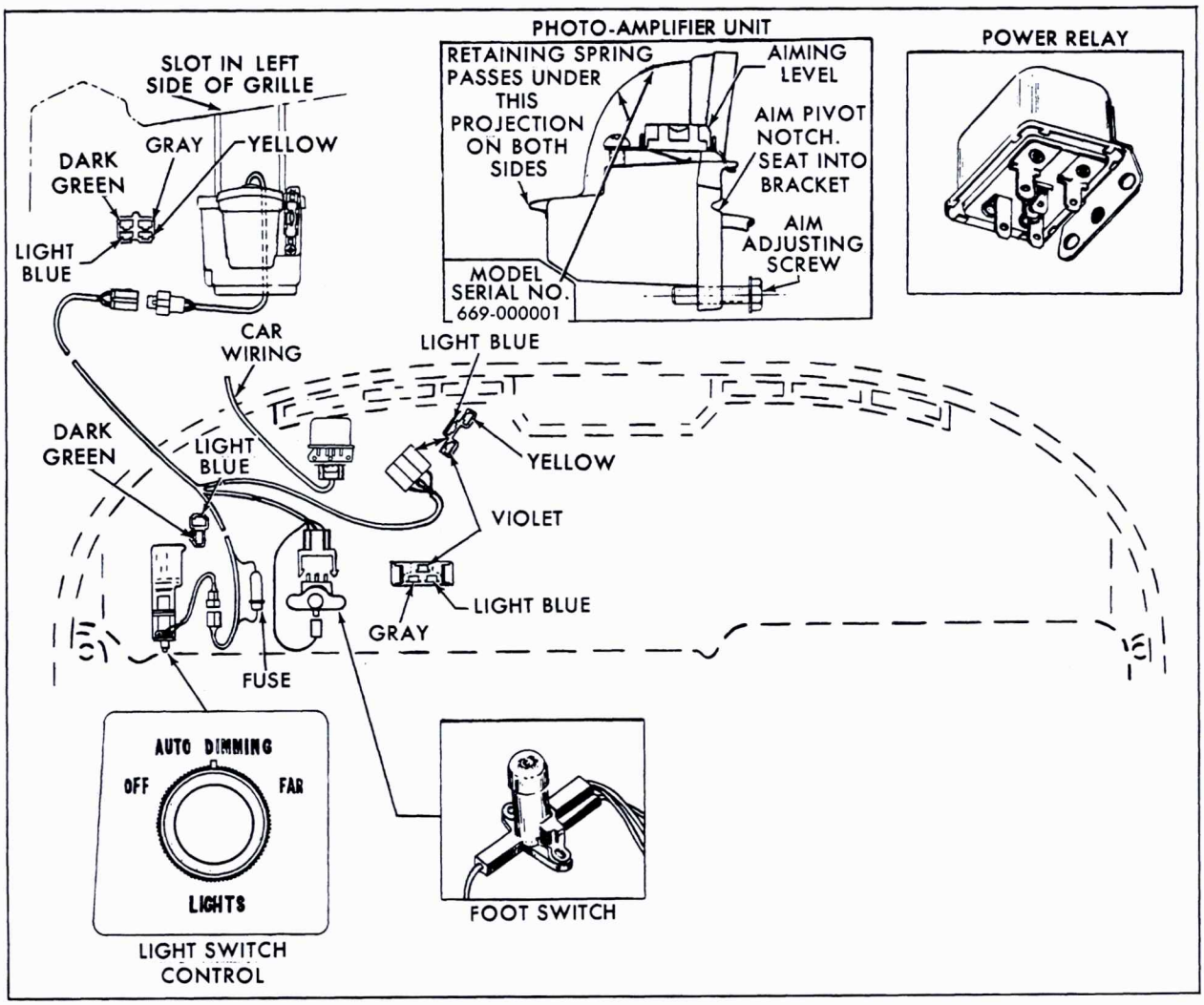


Fig. 15-33 Guide-Matic Components

test for finding "automatic" position of the foot switch.

The sensitivity control ring (driver control), Fig. 15-34, is located directly behind and is concentric with the headlight switch knob. This gives the car driver a limited range of control over Dim and Hold sensitivity. Centering the control ring pointer between the words "Off" and "Far" provides normal sensitivity.

Rotating the ring pointer clockwise toward the word "Far" increases sensitivity and headlights will switch to low beam when an approaching car is farther away. Rotating the ring pointer counterclockwise toward the word "Off" decreases sensitivity, thus allowing an approaching car to come nearer before switching occurs.

The operation of the Guide-Matic is somewhat effected by the character of the road surface (snow, gravel, black top, etc.). To obtain furthest usable dimming distance, turn sensitivity knob fully clockwise after dimming for an oncoming car, and after it has passed, slowly rotate knob counterclockwise until unit returns to high beam. This is the most sensitive usable setting.

For additional function of the control ring, see Operation - Manual.

Operation—Automatic

When the light from an approaching car's headlights strikes the photo-amplifier unit, the lens focuses it onto the light sensitive surface of a photocell. When the light on the photocell reaches a predetermined level, the amplifier section triggers (pulls on) the power relay, causing it to switch (Dim) the headlights from high beam to low beam. If the approaching car's headlights are then switched to low beam, the amount of light striking the photo-amplifier unit is reduced. However, the Guide-Matic is designed to "hold" the headlights on low beam with this reduction.

If driver desires his lights to switch when approaching car is farther away or nearer he may adjust the driver control pointer to suit his desire. Also if approaching driver fails to dim, he may signal him by momentarily "overriding" his headlights back to high beam by putting a slight downward pressure on top of the foot switch. When he removes the pressure his headlights will revert to low beam if sufficient light ahead remains.

When the approaching car passes and its lights no longer reach the photo-amplifier unit, the amplifier removes the signal from the power relay causing it to "drop out" and switch the headlights back to high beam.

If the road surface is highly reflective (snow, gravel, etc.) the unit may be held on low beam by reflections of its own lights. If this occurs, slowly rotate the driver control counterclockwise until lights return to high beam. This is the maximum usable sensitivity for the particular road surface.

Operation—Manual

The Guide-Matic unit can be switched to manual operation by rotating the driver control ring counterclockwise until pointer is in "Off" position as indicated on the left side of the lens. In the "Off" position the photocell is desensitized to the point where the unit will provide only high beam when the foot switch is in "automatic" position.

When the Guide-Matic is placed in the "Off" position, the foot switch operates like a conventional dimmer switch, switching headlights alternately between high and low beams.

Operation—Low Beam

When the foot switch is placed in "low beam" position, the Guide-Matic is disconnected and headlights will remain on low beam until foot switch is changed to "automatic" position.

The car electrical circuit for Guide-Matic installation is shown in Fig. 15-35.

Fig. 15-34 Sensitivity Control Ring

SERVICE INFORMATION

41. Preliminary Checks

If trouble is reported, the condition will generally be one of the following:

A. Headlights switch to low beam when an approaching car is too near or too far away.

B. Headlights will not switch to low beam automatically.

C. Headlights will not return to high beam when no car or other lights are ahead.

D. Headlights return to high beam when approaching car switches to low beam.

E. Headlights switch rapidly back and forth between high and low beam.

The following checks should be performed in sequence during diagnosis to determine the cause and correction of Guide-Matic trouble and to eliminate unnecessary service work.

NOTE: This transistorized Guide-Matic does not require a warm-up time. However, due to the time delay circuitry, it may take approximately four seconds for headlights to switch from low to high beam when photo-amplifier is connected.

Place car in an area where light strikes photo-amplifier. Overhead lights may not accomplish this. Then check as follows:

1. Check position of driver control ring. If pointer is rotated counter-clockwise to the "off"

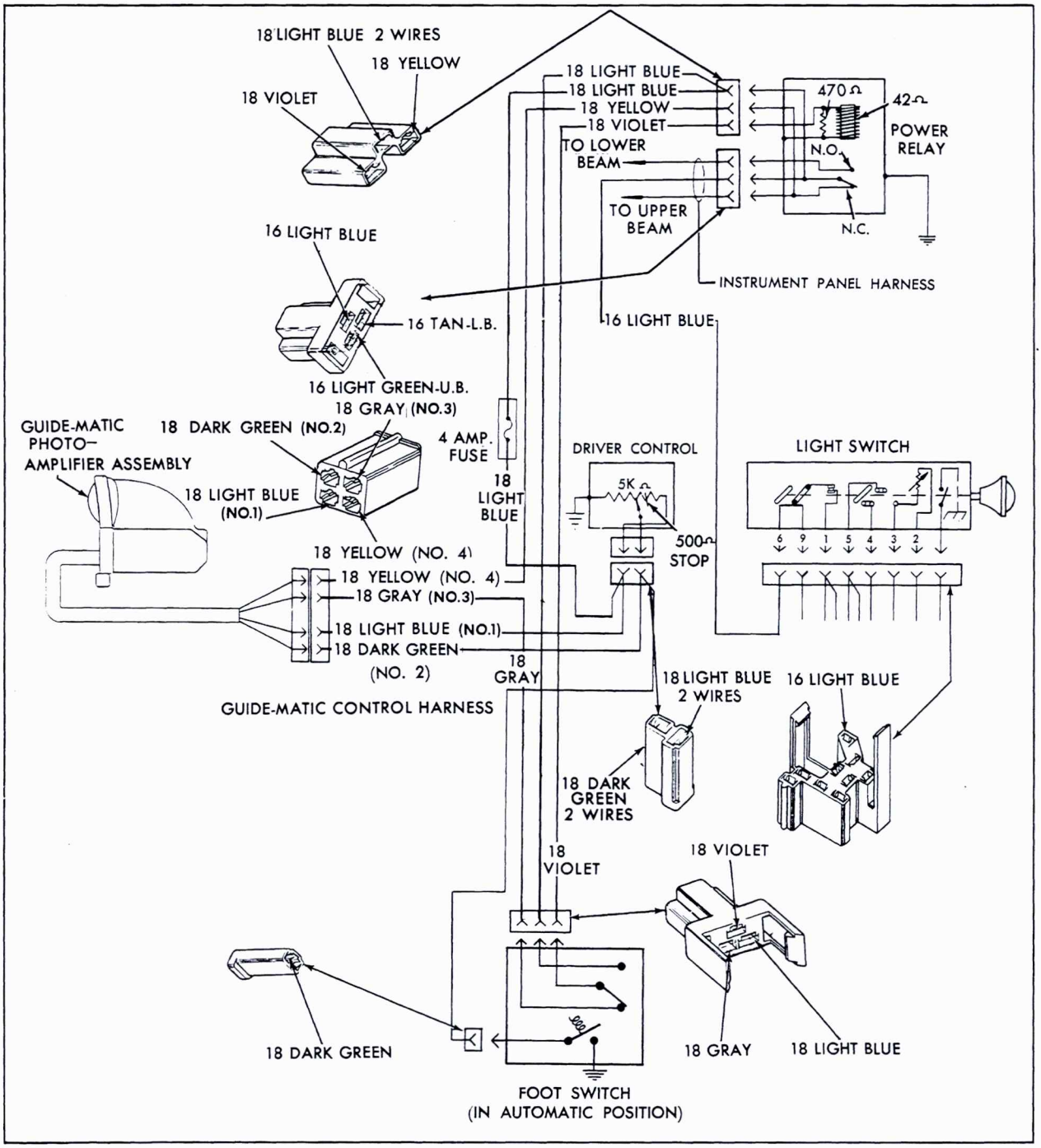


Fig. 15-35 Guide-Matic Circuit Diagram

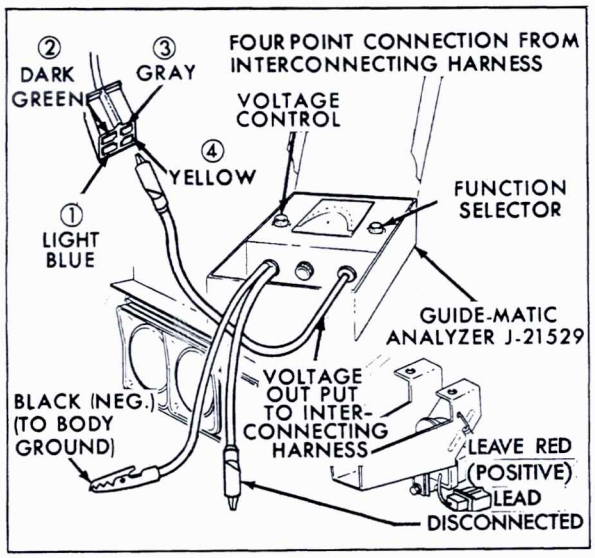


Fig. 15-36 Circuit Check Out From Connector

position, check with the owner to be sure he understands operation of the unit.

2. Operate engine at fast idle.

3. Set driver control ring pointer at approximate center of its travel.

4. Turn light switch on. Headlights should remain on low beam in both positions of foot switch. If so, proceed to step 6. If not, perform the checks outlined in step 5.

5a. Check for loose connection at four-way connector near photo-amplifier. If secure, proceed to step 5b. If loose, secure and check system as outlined in steps 1-4. If system still does not operate properly, continue with step 5b.

b. Disconnect single dark green wire connector at foot switch, Fig. 15-35. If low beam cannot be obtained in both positions of foot switch, connect single dark green wire at foot switch and proceed to step 5c. If low beam can now be obtained in both positions of foot switch, override section of foot switch is shorted. Replace foot switch and proceed to step 6.

c. Disconnect photo-amplifier from nearby four-way multiple connector in interconnecting cable. Connect Guide-Matic Analyzer, J-21529, as shown in Fig. 15-36. Function selector switch is in position No. 1. Red positive +13 volt in lead must be disconnected while black negative lead is connected to body ground. Touch voltage output lead to terminal 1 in multiple connector (18 light blue). Analyzer voltmeter should read full scale. If so, proceed to step 5d. If not, see Fig. 15-35 and check for blown four amp fuse (near driver control connector), or loose connectors at power relay. Perform necessary corrections and make normal system connections. Check as described in steps 1-4. If system still does not operate properly, proceed to step 5d.

d. Leave analyzer connected as shown in Fig. 15-36. Red positive +13 volt DC in lead must be disconnected. Connect voltage output lead to terminal 2 (18 dark green) in multiple connector. Rotating driver control ring should vary meter voltage reading from 0 volts to approximately 3/4 scale. If so, proceed to step 5e. If not, see Fig. 15-35 and check for loose connection at driver control two-way connector or defective driver control. Perform necessary corrections and make normal system connections. Check as described in steps 1-4. If system still does not operate properly, proceed to step 5e.

e. Connect analyzer as shown in Fig. 15-36. Red positive +13 volt DC in lead must be disconnected. Headlights must be on high beam to perform check. If on low beam, depress foot switch fully and release to bring them on high beam. Now touch voltage output lead to terminal 4 (18 yellow) in multiple connector. Analyzer voltmeter should read full scale. If so, proceed to step 5f. If not, see Fig. 15-35 and check for loose connections at power relay. Perform necessary corrections and make normal system connections. Check as described in steps 1-4. If system still does not operate properly, proceed to step 5f.

f. Connect analyzer + and -13 volt DC in-leads Fig. 15-36. Connect voltage output lead to terminal 3 (18 gray). With function selector switch in position #1, rotate voltage control knob fully clockwise. If headlights are on low beam in both positions of foot switch, replace defective photo-amplifier. If not, proceed to step 5g.

g. Check for defective power relay. Connect analyzer, J-21529, as shown in Fig. 15-37. Headlights should switch to low beam with voltage control knob at maximum clockwise position and function selector switch in position #1. If so, proceed to step 5h. If not, replace power relay. Make normal system connections and check as described in steps 1-4. If system still does not operate properly, proceed to step 5h.

h. Check for defective foot switch. To check connect Analyzer, J-21529, as shown in Fig. 15-38. Headlights should remain on low beam in both positions of foot switch with voltage control knob at maximum clockwise position and function selector switch in position #1. If so, proceed to step 5i. If not, replace foot switch and make normal system connections. Check as described in steps 1-4. If system still does not operate properly, proceed to step 5i.

i. If problem was not found in steps 5a through 5h, the photo-amplifier is defective. Replace photo amplifier.

j. Disconnect analyzer and make normal system connections.

6. Place foot switch in automatic position as described in 6a.

a. Depress foot switch slightly. If headlights switch to high beam, foot switch is in automatic position. If not, depress foot switch fully and release. Again depress foot switch slightly. If headlights switch to high beam, foot switch is in automatic position.

b. If foot switch automatic position can be determined as described in step 6a, proceed to step 7. If not, perform the following checks:

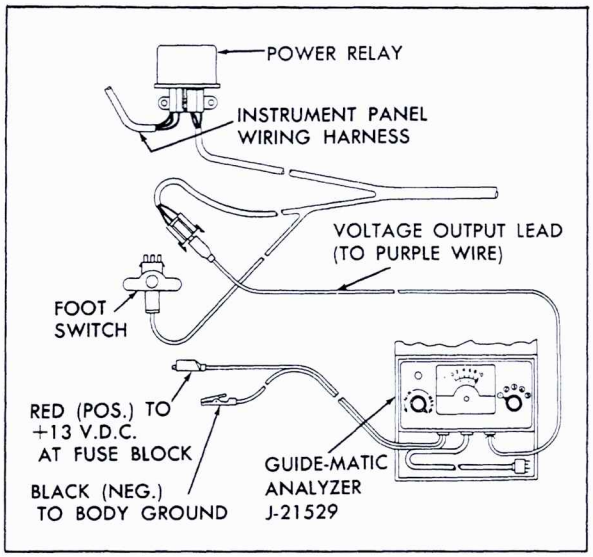


Fig. 15-37 Power Relay Check

c. Check for disconnected dark green wire at foot switch. If connected, proceed to step 6d. If not, connect and repeat step 6a. If system still does not operate properly, proceed to step 6d.

d. Disconnect dark green wire from foot switch and ground to car body. Repeat step 6a. If high beam can be obtained, replace defective foot switch and proceed to step 7. If not, proceed to step 6e.

e. If lights still fail to switch to high beam, replace defective photo-amplifier.

7. Place foot switch in automatic position. See Note 6a if in doubt of position. Cover completely outer plastic lens opening on front of photo-amplifier with a black cloth. Headlights should switch to low beam. If so, proceed to step 8.

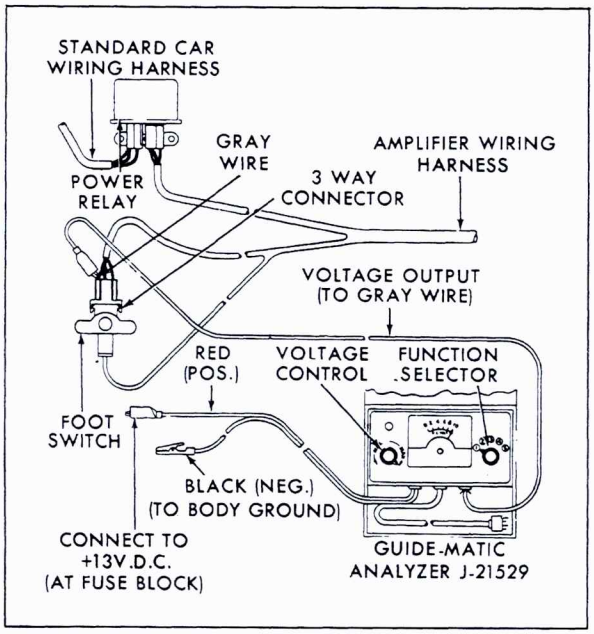


Fig. 15-38 Foot Switch Check

If high beam cannot be obtained, perform the following check:

a. Disconnect photo-amplifier from nearby four-way multiple connector in interconnecting cable. If headlights switch to high beam, replace defective photo-amplifier.

8. Leave foot switch in automatic position. See step 6a if in doubt of position. With headlights on low beam, rotate driver control ring pointer counterclockwise to "off" position. Headlights should switch to high beam. If so, proceed to step 9. If not, see Fig. 15-35 and check driver control for defective connection to ground.

9. If Guide-Matic responded to steps 5 through 8 without failure, perform the following steps:

a. Check vertical aim adjustment as outlined in Note 42.

b. Check Dim and Hold Sensitivity as outlined in Note 43.

42. Vertical Aiming Adjustment

Accurate vertical aim is essential to proper performance of the Guide-Matic. If the photo-amplifier unit is aimed too low, reflected road light from the car's own headlights can cause the Guide-Matic to hold the headlights on low beam. The unit must be aimed as low as possible, however, to provide maximum tolerance for car loading.

NOTE: The aiming procedure outlined here should be rechecked on new cars that have been driven at least 2,000 miles.

1. Photo-amplifier vertical aiming should be performed with car unloaded, trunk empty except for spare tire, gas tank at least half full and tires at correct pressure.

2. Locate car on level floor (level within 1/4 inch fore and aft).

3. Rock car sideways or up and down to equalize springs.

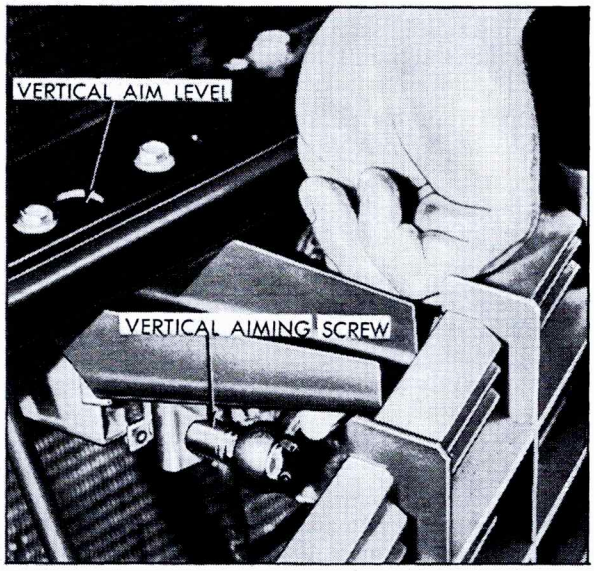


Fig. 15-39 Vertical Aim Adjustment

4. Raise car hood.

5. Adjust vertical aiming screw at front of phototube unit until bubble is centered in level, Fig. 15-39.

NOTE: Always make final adjustment while turning screw clockwise.

43. Dim and Hold Sensitivity Test on Car

The individual sensitivity controls for Dim and Hold are located in the photo-amplifier and are adjusted and sealed at the factory so they are not accessible in the field. Our sensitivity check is only to determine if the driver control can be adjusted to provide the driver at least a minimum acceptable dimming sensitivity (switch to low beam) and at the same time provide an acceptable hold sensitivity (point of return to high beam).

1. Preparation for Test

a. Use Guide-Matic Analyzer, J-21529, with Guide-Matic Analyzer Adapter, J-22622. Since an individual test bulb is no longer incorporated in each photo-amplifier, it is necessary to adapt the present analyzer test bulb assembly (previously designed for use with the Twilight Sentinel) to supply a calibrated light source. A dome-shaped filter is glued into the adapter to reduce light to a level consistent with Guide-Matic sensitivity. The test bulb assembly plugs into the rear of the adapter head. If bulb burns out, replace with a #53 bulb. Make sure filament of bulb is standing fairly straight up so that a minimum of the side of the filament is exposed to the end of the bulb. The end of the bulb should be approximately flush with the end of its rubber sleeve.

b. Install analyzer test bulb assembly into smaller diameter hole in rear of adapter head. Push bulb and rubber sleeve forward until they stop against inner bulkhead wall of adapter head, Fig. 15-40.

c. Install and connect analyzer as shown in Fig. 15-40. Be sure adapter is seated snugly around lens and bail is snapped tightly into position. Remove two screws securing photo-amplifier shield, mount adapter and reinstall shield. Do not disconnect electrical connectors.

NOTE: It may be necessary to remove unit to install tester. If so, connect ground wire to unit before operating.

d. Cover photo-amplifier with black cloth to eliminate outside light.

e. Rotate analyzer function selector switch to #1 position.

f. Rotate driver control ring pointer counter-clockwise to "off position.

g. Turn on headlights and operate engine at fast idle.

h. Place foot switch in automatic position.

2. Test Procedure

a. Adjust analyzer voltage control knob until meter reads 7.0 volts.

b. Slowly rotate driver control ring clockwise just to point where headlights switch to low beam.

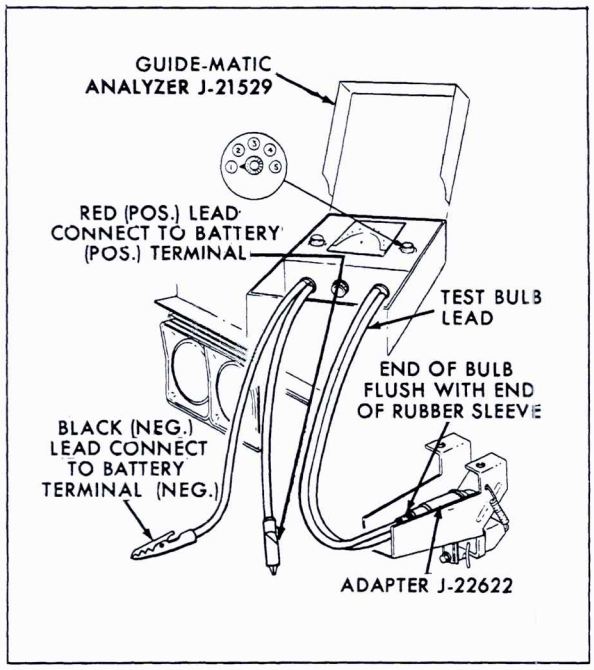


Fig. 15-40 Dim and Hold Sensitivity Test

c. Check accuracy of driver control adjustment by rotating analyzer voltage control knob counter-clockwise until headlights switch to high beam. Then slowly rotate analyzer voltage control knob clockwise until headlights switch to low beam. Voltmeter should read between 6.5 and 7.0 volts.

d. If reading does not agree, repeat steps a, b, and c.

e. Rotate analyzer voltage control knob counterclockwise to a reading that is 1.0 volt less than reading obtained for switching to low beam in step c. Wait four seconds and headlights should not switch to high beam. Rotate analyzer voltage control knob counterclockwise to a reading that is 3 volts less than reading obtained for switching to low beam in step c. Headlights should switch to high beam within four seconds.

f. If this minimum dim and hold sensitivity can be obtained at any position of the driver control ring, the unit is acceptable for sensitivity and you may proceed to step g. If Dim (switching to low beam) sensitivity cannot be adjusted (step b), replace defective photo-amplifier. If dim and hold sensitivity readings are close together on the analyzer voltmeter (less than one volt) see Fig. 15-35 and check for open 18 yellow wire between power relay and 4-way connector near photo-amplifier. Follow procedure outlined under 5e of Preliminary Checks. If all right, replace photo-amplifier.

g. Turn off engine, disconnect analyzer, reconnect any wires previously disconnected, and remove black cloth from photo-amplifier. If it was necessary to remove photo-amplifier from bracket, reinstall and perform vertical aim adjustment as described in Note 42.

44. Sensitivity Control Switch

The procedure for removing and installing the Guide-Matic sensitivity control switch is described in Section 12, Note 60.

45. Photo-Amplifier Unit

a. Removal

1. Disconnect negative battery cable at battery.
2. Disconnect four-way electrical connector near photo-amplifier.

CAUTION: Do not pull on cable sheathing, otherwise leads could be damaged.

3. Remove screw securing photo-amplifier unit to mounting bracket and release retaining spring.
4. Carefully remove photo-amplifier unit from mounting bracket.

b. Installation

1. Connect retaining spring to photo-amplifier unit.
2. Install photo-amplifier unit on mounting bracket and secure with screw.
3. Connect four-way electrical connector near photo-amplifier.

CAUTION: Make sure connector is firmly installed.

4. Connect negative battery cable at battery.
5. Adjust vertical aim as described in Note 42.

46. Power Relay Unit

a. Removal

1. Disconnect negative battery cable at battery.
2. Disconnect two three-way electrical connectors from power relay unit.
3. Remove two screws that hold power relay unit to toe pan and remove unit.

b. Installation

1. Position power relay unit against toe pan and secure with two screws.
2. Connect two three-way connectors to power relay unit.
3. Connect negative battery cable to battery.

47. Foot Switch

a. Removal

1. Disconnect negative battery cable at battery.
2. Remove left side kick pad.
3. Remove rubber boot from foot switch.
4. Partially raise floor carpet to gain access to foot switch.
5. Disconnect one-way and three-way electrical connectors at foot switch.
6. Remove two screws that hold foot switch to floor pan and remove foot switch.

b. Installation

1. Install foot switch on floor pan and secure with two attaching screws.
2. Connect one-way and three-way connectors to foot switch.
3. Reposition floor carpet and install left side kick pad.
4. Install rubber boot on foot switch.
5. Connect negative battery cable to battery.

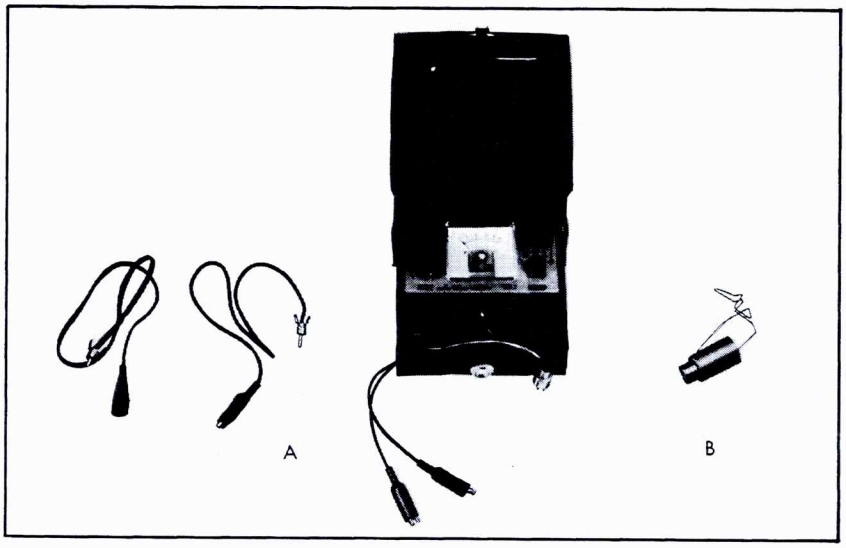
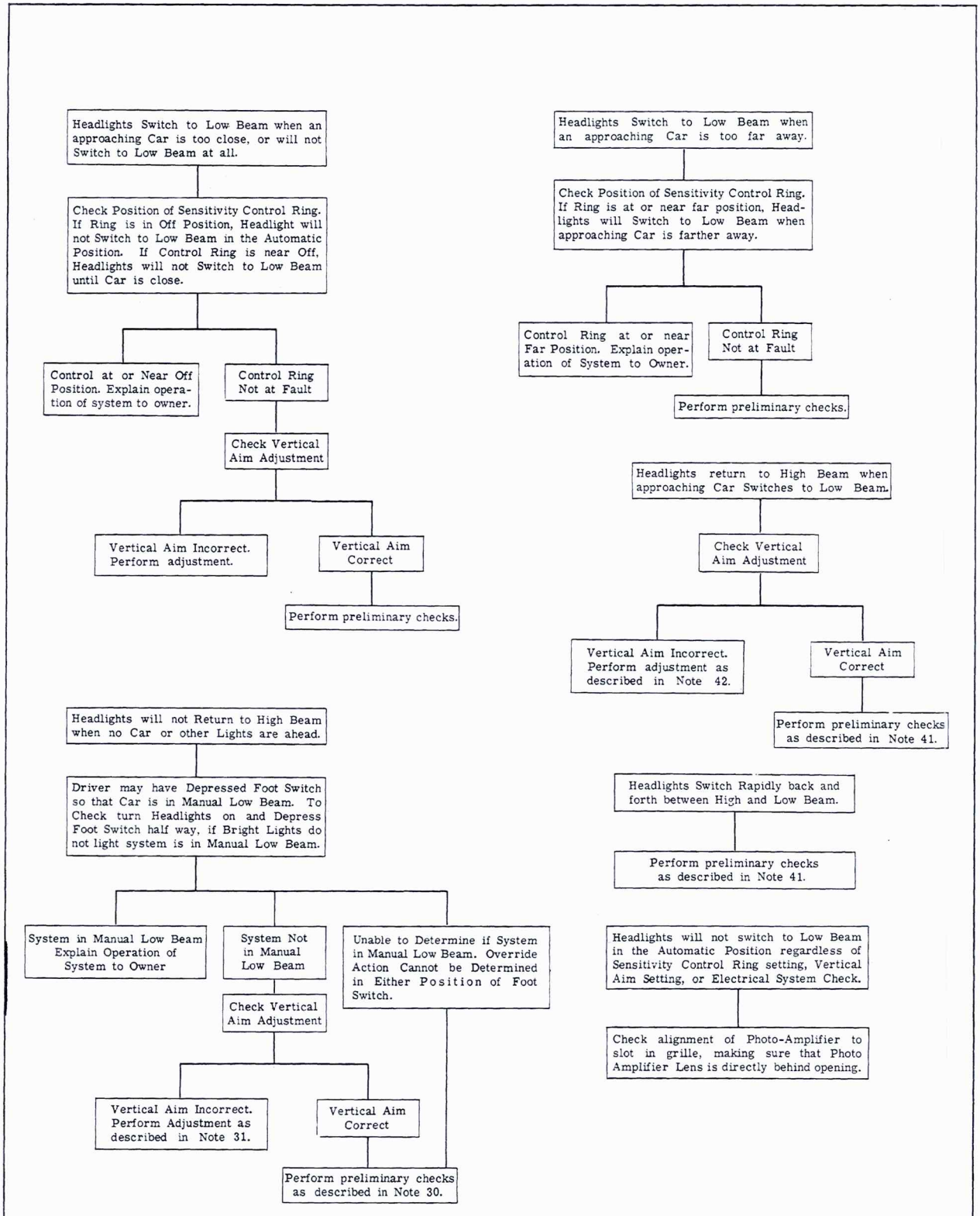


Fig. 15-41 Special Tools - Guide-Matic

Key	Tool No.	Name
A	J-21529	Guide-Matic Analyzer
B	J-22622	Guide-Matic Analyzer Adapter

GUIDE MATIC TROUBLE DIAGNOSIS



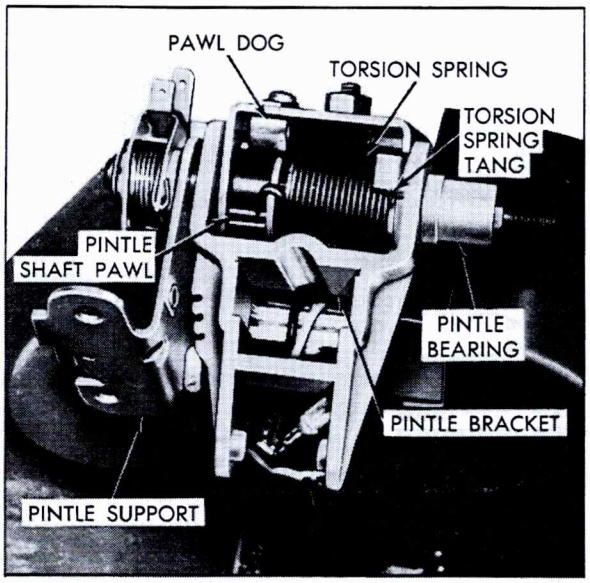


Fig. 15-22 Magnet Assembly Assembly

d. Magnet Assembly Installation

1. Position compressor rod helper spring with shorter end positioned against tang of pintle support.
2. Install magnet assembly into housing, engaging pin of contact arm actuator with hole in contact arm. Align bracket tangs on bottom of magnet assembly with grooves in drive screw nut. Tang on pintle support must engage notch in compressor rod bearing and long end of compressor rod helper spring should be able to be pulled upward.
3. Install pintle bearing block and secure with two screws.
4. Install two screws that secure pintle support to housing.
5. Using a pair of needle nose pliers, hook compressor rod helper spring under tab on plastic compressor rod cap.
6. Install exterior arm on pintle shaft, so that hole in exterior arm can be aligned with hole in housing. Secure with nut.
7. Connect black motor wire at close throttle motor feed point routing under black wire at relay and gray wire at contact arm, Fig. 15-19.
8. Connect red motor wire at lower inboard terminal of auto relay switch (capacitor side), Fig. 15-19.
9. Connect red, black, black with yellow stripe and yellow wires at terminal board, Fig. 15-19, routing red wire under helper spring.
10. Perform limit switch and throttle switch points adjustment as outlined in Note 22.
11. Perform motor feed points adjustment as outlined in Note 21.

e. Motor Removal

1. Remove three screws that secure cover to housing and remove cover.
2. Disconnect red motor wire at lower inboard terminal of auto relay switch (capacitor side), Fig. 15-19.
3. Disconnect black motor wire at close throttle motor feed point and free wire, Fig. 15-19.
4. Remove two screws that secure motor to housing and remove motor.

f. Motor Installation

1. Position motor on housing and secure with two screws, guiding red and black wires through housing. Make certain that bracket tangs on bottom of magnet assembly align with grooves in drive screw nut and drive shaft screw aligns with hole in adjusting screw and hole in motor.

NOTE: Be careful not to lose adjusting screw insert.

2. Check drive screw to see if it will turn. If not, adjust as described in step 3.
3. Turn adjusting screw until it is tight. Do not force. Then back off screw 1/4 turn.

NOTE: Do not remove adjusting screw as a normal service procedure. Repeated removal and installation of adjusting screw will ruin threads. Remove it only if it is to be replaced. A slight adjustment is all that is needed.

4. Connect black motor feed wire at close throttle motor feed point, routing under black wire at relay and gray wire at contact arm, Fig. 15-19.
5. Connect red motor feed wire at lower inboard terminal of auto relay switch (capacitor side), Fig. 15-19.
6. Install cover on housing and secure with three screws.

g. Drive Screw Assembly Removal

1. Remove three screws that secure cover to housing and remove cover.
2. Remove magnet assembly as described in part a of this note.
3. Remove motor as described in part e of this note.
4. Remove drive screw assembly.

h. Drive Screw Assembly Installation

1. Lubricate drive screw assembly sparingly with cam and bearing lubricant.
2. Install drive screw assembly in housing.

NOTE: Be careful not to lose adjusting screw insert.

3. Turn adjusting screw until it is tight. Do not force. Then back off screw 1/4 turn.

NOTE: Do not remove adjusting screw as a normal service procedure. Repeated removal and installation of adjusting screw will ruin threads. Remove it only if it is to be replaced. A slight adjustment is all that is needed.

4. Install motor as described in part f of this note.
5. Install magnet assembly as described in part d of this note.
6. Install cover on housing and secure with three screws.

i. Governor Assembly, Removal, Disassembly and Speedometer Gear Removal

1. Remove three screws that secure cover to housing and remove cover.
2. Using a 12-volt power source, attach negative lead to housing. Manually move center contact arm to close throttle position and touch positive lead to terminal number 2 on terminal board.

NOTE: Terminal board is numbered on inside with respective terminal numbers.

3. Remove screw and flatwasher securing governor shaft bearing and remove bearing.
4. Disconnect pin on contact arm actuator from contact arm by inserting a screwdriver and carefully prying free.
5. Turn governor weights so they are parallel with sides of housing. Push weights toward governor spring until gear end of governor drive shaft and gear is free of governor shaft bushing.
6. Raise governor weights and pull governor assembly from housing.

NOTE: Do not lose two spacers and thrust bearing from gear end of governor drive shaft and gear.

7. Remove two spacers and thrust bearing.
8. Remove governor spring from governor drive shaft and gear.

NOTE: Do not stretch or damage spring.

9. Remove contact arm actuator from governor drive shaft and gear.
10. Remove snap ring, spacer and wave washer and governor weights from governor drive shaft and gear.
11. Drive out retaining pin from inside of housing and remove speedometer gear.

NOTE: Same pin will be used upon installation.

j. Speedometer Gear Installation, Governor Assembly and Installation

1. Lubricate speedometer gear with cam and bearing lubricant, and install speedometer gear in speedometer gear bushing. Retain by driving in speedometer retainer pin from outside of housing.
2. Slide governor weights, wave washer, spacer on governor drive shaft and gear and secure with snap ring.
3. Install contact arm actuator and governor spring on governor drive shaft and gear.

NOTE: Governor spring must be installed so that wide coil spacing is toward contact arm actuator.

4. Install spacer, thrust bearing and second spacer on gear end of governor drive shaft and gear.
5. With governor weights parallel with sides of housing, install governor assembly into housing by inserting spring end of governor drive shaft and gear into compressor rod plastic cap and hole in housing. Then install gear end of governor drive shaft and gear into governor shaft bushing, engaging speedometer gear.
6. Insert pin on contact arm actuator into hole in contact arm by prying against contact arm with a screwdriver.
7. Install governor shaft bearing and secure with flatwasher and screw. Flatwasher must not ride on center ridge of bearing.
8. Perform motor feed points adjustment as outlined in Note 21.

k. Compressor Rod and Dust Shield Removal

1. Remove three screws that secure cover to housing and remove cover.
2. Using a 12-volt power source, attach negative lead to housing. Manually move center contact arm to close throttle position and touch positive lead to terminal number 2 on terminal board.

NOTE: Terminal board is numbered on inside with respective terminal numbers.

3. Remove screw and flatwasher securing governor shaft bearing and remove bearing.
4. Disconnect pin on contact arm actuator from contact arm by inserting a screwdriver and carefully prying free.
5. Turn governor weights so they are parallel with sides of housing. Push weights toward governor spring until gear end of governor drive shaft and gear is free of governor shaft bushing.
6. Raise governor weights and pull governor assembly from housing.

NOTE: Do not lose two spacers and thrust bearing from gear end of governor drive shaft and gear.

7. Remove compressor rod helper spring.
8. Pull up compressor rod against its stop and measure gap between compressor rod plastic cap and housing using a feeler gage. Record measurement, Fig. 15-19.

IMPORTANT: This measurement will be essential for accurate out-of-car compressor rod adjustment.

9. Push compressor rod down and remove adjustable coupling with a screwdriver.
10. Remove two screws that secure dustshield to housing and remove dustshield and dust seal.
11. Loosen two screws that secure pintle bearing block to housing and two screws that secure pintle support to housing enough to free compressor rod bearing.
12. Remove compressor rod assembly from

GENERAL DESCRIPTION

TWILIGHT SENTINEL

The Twilight Sentinel (available as optional equipment) is a semi-automatic electronic device that can automatically control the on-off operation of the headlights, taillights, parking, side marker, license, and instrument panel lights of the car on which it is installed. It also provides a feed for the cornering light circuit. A time delay turn-off control permits the car lights to remain on, if desired, for a pre-selected period of time after the ignition switch is turned off. The complete system consists of three units: a photocell unit, an amplifier unit, and a variable time delay turn-off and master on-off control, Fig. 15-42.

The photocell unit is a light sensing device that is mounted with the sensing surface facing upward so it is exposed to direct outside light through the windshield. Mounting location, on cars equipped with stereo, is on the underside of the small speaker grille in the left end of the upper instrument panel cover. Mounting location, on cars without stereo, is on the underside of the regular front speaker grille in the upper instrument panel, Fig. 15-42. Light strikes the sensing surface through an opening in the speaker grille. The internal resistance of the photocell varies according to amount of light striking the sensing surface. As the amount of light is reduced, the internal resistance of the photocell increases until finally it actuates the amplifier to turn the lights on.

The amplifier unit, which consists of a transistor amplifier, sensitive relay, power relay, and transistor turn-off time delay, switches the car lights on or off in response to signals from the photocell. The amplifier is located on the lower steering column cover. A serial number label, Fig. 0-1, is attached to the end of the unit.

The time delay turn-off control ring, Fig. 15-43, is located directly behind and is concentric with the standard headlight switch knob. This ring controls the time delay turn-off feature and also operates the manual-automatic switch. The electrical circuit for the Twilight Sentinel is shown in Fig. 15-44.

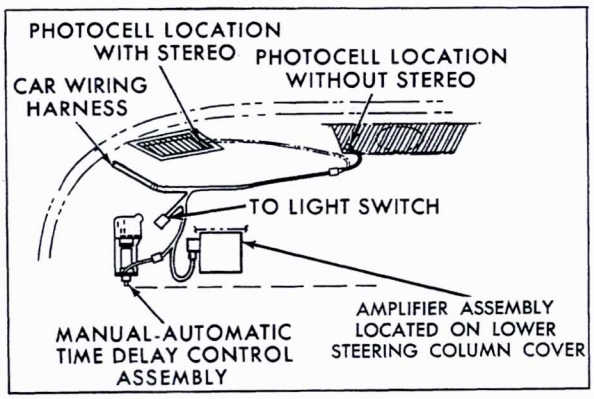


Fig. 15-42 Twilight Sentinel Components

Operation—Automatic

With the time delay turn-off control ring pointer in ON position (anywhere counterclockwise of OFF), ignition switch turned on, and headlight switch off, the Twilight Sentinel provides completely automatic on-off operation of the car lights. As daylight reduces to the point where lights are needed for illumination, the Twilight Sentinel will automatically turn the car lights on.

The time delay circuit in the amplifier, which reduces the possibility of lights turning on when passing under viaducts or tree, or turning off when passing under bright lights, has a nominal ten to thirty second delay. The time delay may vary between 10 and 60 seconds.

The variable time delay turn-off control permits the car lights to remain on for a pre-selected period after the ignition is turned off. The driver may choose any delay period from a few seconds to a maximum of one to three minutes by rotating the control ring pointer to the desired position. Additional side lighting can be obtained by turning on a cornering light.

Operation—Manual

If the driver desires to turn on his car lights at any time, which may be necessary to identify the car in such conditions as fog, rain or when driving through a tunnel, he may do so by operating the regular light switch. This parallels the operation of the Twilight Sentinel, and the regular light switch must be turned off before the Twilight Sentinel can regain control.

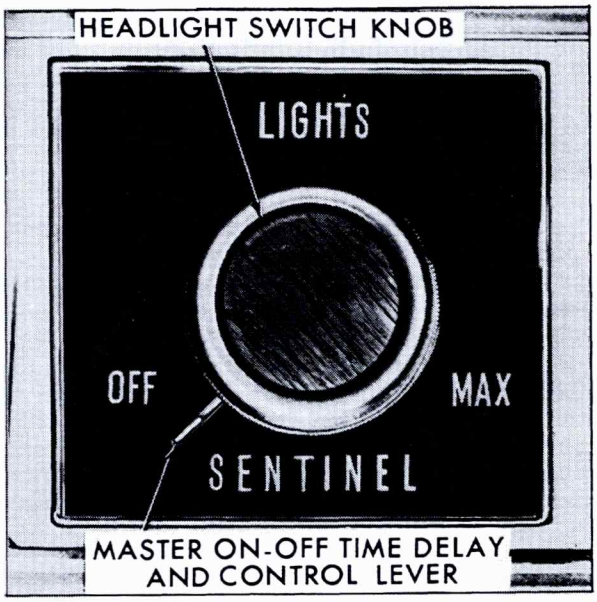


Fig. 15-43 Twilight Sentinel Control Lever

To obtain manual operation of the car lights, place time delay turn-off control pointer in OFF position (extreme clockwise position). Lights will now operate only by the regular light switch.

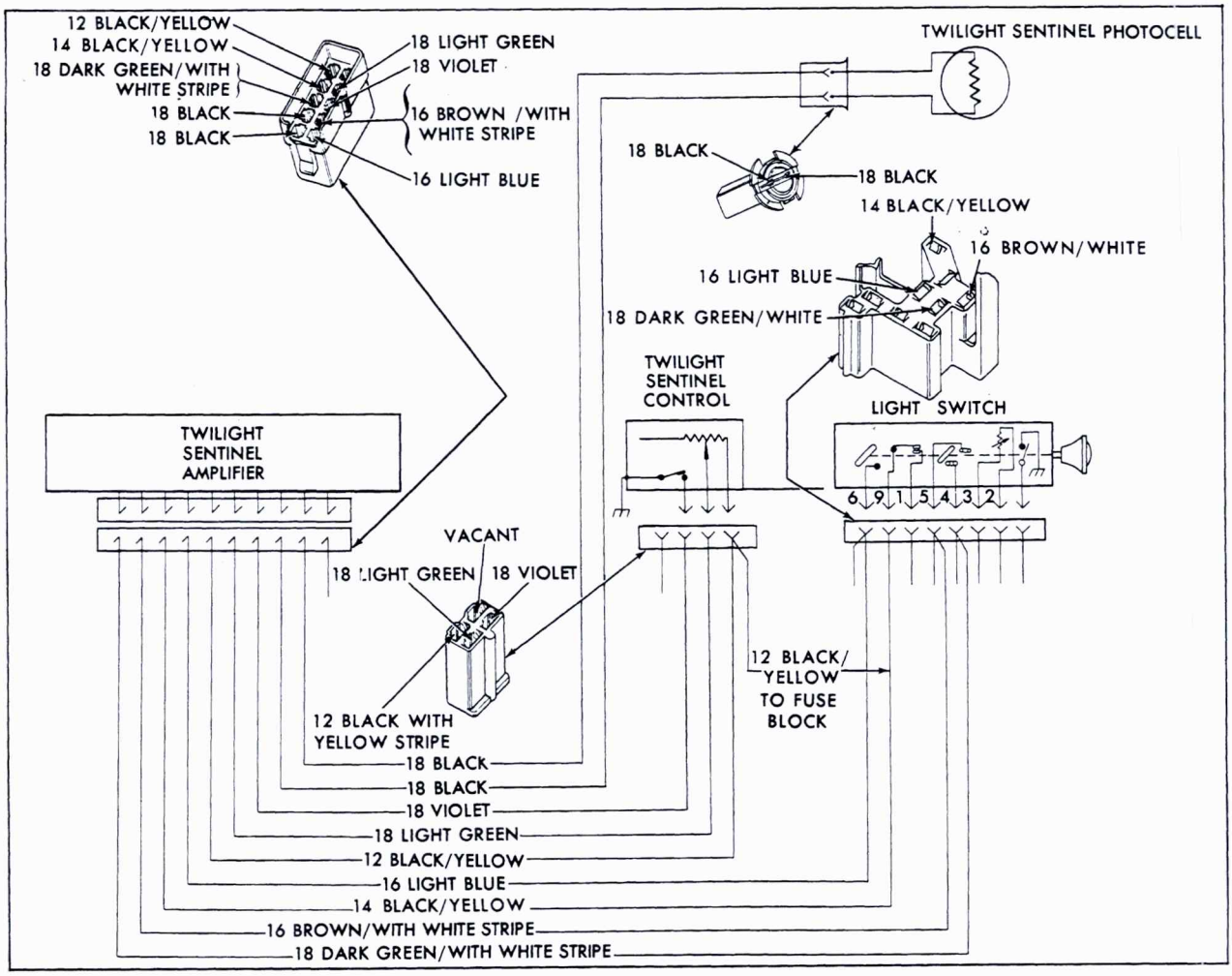


Fig. 15-44 Twilight Sentinel Circuit Diagram

SERVICE INFORMATION

48. Preliminary Checks

If trouble is reported, the condition will generally be one of the following:

A. Lights turn on too early or too late in the evening.

B. Lights remain on during daytime driving.

C. Lights fail to turn on automatically.

D. No turn-off time delay.

E. Excessive turn-off time delay or lights fail to turn off after ignition is turned off.

The following checks should be performed in sequence during diagnosis to determine the cause and correction and to eliminate unnecessary service work.

1. Check time delay control ring pointer for possibility of being rotated to "off position."

2. Make sure owner is not covering photocell opening with some object such as notebook, paper, cigarette package or hat.

3. If photocell is suddenly exposed to light or darkness, the time delay must run out (10 to 60 seconds) before amplifier can switch.

4. Make sure owner is operating unit with regular light switch turned off.

5. Check taillight fuse, instrument panel fuse, cornering, parking, and front marker fuse for possible burnout.

If steps 1 through 5 do not isolate problem, proceed to step 6. If checks 1 through 4 indicate owner misunderstanding, proper operation should be explained to him.

6. Place black cloth over photocell opening in radio speaker grille. (Remember, if car has stereo radio, the photocell is under small speaker grille on left end of upper instrument panel cover.

If car is not equipped with stereo, photocell is under left side of regular front speaker grille.)

7. Turn regular headlight switch OFF. Rotate time delay control ring pointer to ON position so that pointer is approximately straight down.

8. Turn ignition on. Do not start engine. Car lights should turn on within from a few seconds to a maximum of 60 seconds. If they do, proceed to step 9. If lights fail to turn on, perform the following checks:

a. Check for blown taillight fuse at fuse panel if headlights turn on but taillights fail to turn on.

b. Check for blown cornering, parking and front marker fuse if parking and front marker lights fail to come on. Fuse also acts as circuit protector for ash tray lamp.

c. Check for blown instrument panel fuse if these lights fail to turn on.

d. Turn regular light switch on. If headlights fail to turn on, car wiring is defective. If headlights turn on, check for defective wiring or connections between amplifier and light switch. Turn regular light switch off.

e. Check for loose ground connection or loose wiring harness connection at amplifier unit. Connect jumper wire between body ground and purple wire in amplifier 10-way connector. If lights turn on, check ground path through manual-automatic switch section of turn-off time delay control.

f. Disconnect either black wire (amplifier to photocell) from amplifier 10-way connector. If lights turn on, the photocell unit is defective and must be replaced and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49.

g. If car lights still fail to turn on after performing steps "a" through "f", amplifier is defective and must be replaced, and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49.

9. Remove black cloth from photocell opening. Shine bright light (flashlight) in photocell opening in speaker grille. Car lights should turn off within 10 to 60 seconds (depending on the time delay run out). If they do, proceed to step 10. If not, perform the following checks:

a. Check for open wire connections between amplifier and photocell. (Black and gray wires on amplifier side of 10-way connector or two black wires on car wiring side of 10-way connector.)

b. Connect jumper wire between black and gray amplifier to photocell wires in 10-way connector on side of amplifier. If car lights turn off within a few seconds, photocell is disconnected, not mounted properly, or defective. If lights remain on, amplifier is defective and must be replaced, and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49.

c. To service photocell, remove upper instrument panel cover as described in Section 12, Note 44a and check for loose connection where photocell plugs into socket, or photocell not properly mounted. If photocell is connected and secure, then photocell is defective and must be replaced, and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49. Install upper instrument panel cover as described in Section 12, Note 44b.

10. Cover photocell opening with black cloth and rotate time delay control ring pointer to maximum time delay position (extreme counterclockwise). Now wait until time delay runs out and headlights turn on. After headlights turn on, turn ignition off. Car lights should remain on for one to three minutes. If lights fail to operate as described above, perform the following checks as required:

a. NO TIME DELAY OR INSUFFICIENT TIME DELAY -- Check for shorted wiring and defective time delay control potentiometer. If no defects are indicated, amplifier is defective and must be replaced, and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49.

b. EXCESSIVE TIME DELAY AFTER IGNITION TURN OFF -- Check for open wire connection or open time delay control. If all right, the amplifier is defective and must be replaced, and sensitivity readjusted. See Sensitivity Test and Adjustment, Note 49.

11. If Twilight Sentinel responded to all of the above tests, the unit is functioning normally.

49. Sensitivity Test and Adjustment

Use Guide-Matic Analyzer, J-21529, when performing test and adjustment. To locate photocell opening in radio front speaker grille for positioning test bulb assembly, make templates as shown in Fig. 15-45, (actual size) out of heavy paper or metal. CAUTION: BE SURE MASKING TAPE (Scotch Brand #213 or its equivalent) IS PLACED OVER HOLES AS SHOWN TO PROVIDE LIGHT DIFFUSION OVER HOLE AREA. If tape is too thick or dark, insufficient light will reach cell and tester will not operate unit. Analyzer test bulb should be positioned with bulb end even with rubber boot opening. Remove wire clip in boot if necessary to reposition bulb. Check bulb for blackening or other defects. Filament should be standing up (lengthwise to bulb) so that least possible side view of filament is exposed to the bulb end. Replace with a new #53 bulb if necessary.

a. Preparation for Test and Adjustment

1. Place proper template over speaker grille as shown in Fig. 15-46. Tape template to grille to maintain proper position.

2. Remove amplifier from behind lower steering column cover as described in Section 12, Note 83a.

3. Insert screwdriver in hole as shown in Fig. 15-47 and turn time delay interlock screw counterclockwise until the screw head no longer contacts the two solder pads on the circuit board.

4. Connect lead of test bulb assembly (part of Analyzer J-21529) to voltage output socket on Analyzer, Fig. 15-46.

5. Connect 13 VCD "in" leads as shown in Fig.

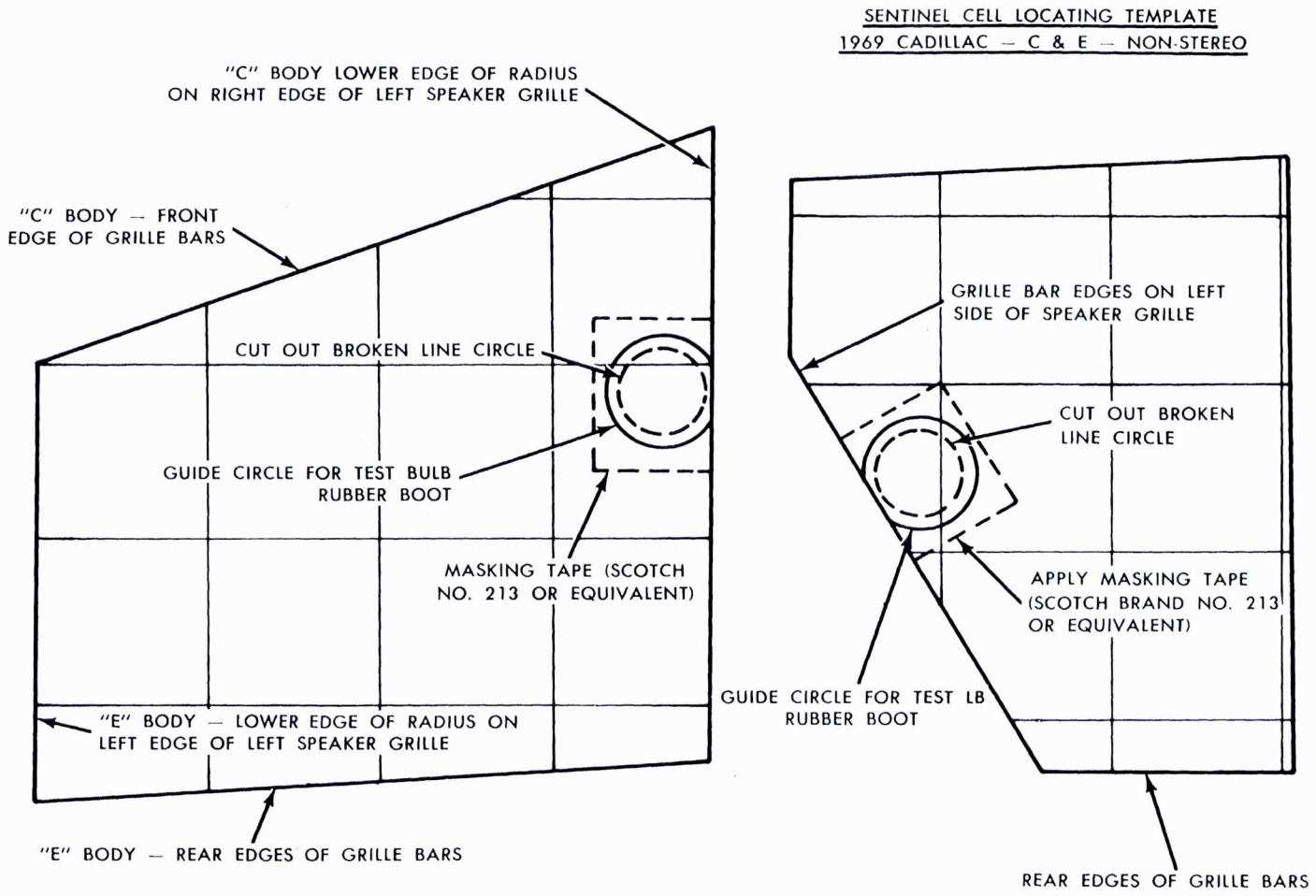


Fig. 15-45 Photocell Locating Templates

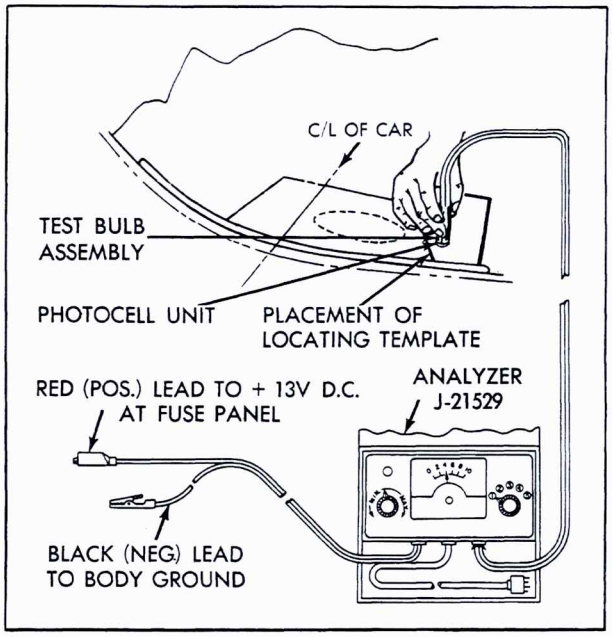


Fig. 15-46 Sensitivity Test & Adjustment

15-46. Place Analyzer function selector knob in position No. 1.

6. Rotate Analyzer voltage control knob fully clockwise.

7. Place time delay control ring pointer in "on" position (anywhere counterclockwise of "off").

8. Turn ignition switch on. If Analyzer voltmeter does not read full scale or higher, start engine and operate at fast idle. Lights should turn on.

b. Sensitivity Test Procedure

1. Place test bulb assembly down on template hole over photocell. Rubber boot should be located within outer ring around hole in template. Lights should turn off. IMPORTANT - TEST BULB MUST BE HELD FIRMLY IN POSITION ON TEMPLATE DURING TESTING OR ADJUSTING TAPING IN POSITION MAY BE NECESSARY.

2. Slowly rotate Analyzer voltage control counterclockwise until car lights turn on and record voltage reading on voltmeter. Lights should turn on between 4.0 and 7.0 volts.

3. Slowly rotate Analyzer voltage control knob clockwise until car lights turn off and record voltage reading on voltmeter. Reading should be between 0.5 and 2.5 volts greater than turn-on voltage reading obtained in step 2.

4. If Twilight Sentinel responded satisfactorily in steps 1, 2, and 3, the set is functioning normally within sensitivity range. Tighten time delay interlock screw and reinstall amplifier. If not, and Trouble Diagnosis Procedures on page 15-55 indicate sensitivity problem only, proceed to Sensitivity Adjustment Procedure.

CAUTION: Be careful when tightening interlock screw so that threads in circuit board do not become stripped. If the threads should become stripped, the screw should be removed and a jumper strip soldered between the two solder islands.

c. Sensitivity Adjustment Procedure

1. Conditions for Sensitivity Test Procedure still apply. It may be necessary to operate engine at fast idle.

2. Adjust amplifier sensitivity control clockwise (through serial label on end of amplifier) to end of rotation. (See Fig. 15-48)

3. Adjust Analyzer voltmeter to a full scale reading and place test bulb down on template hole over photocell. Rubber boot must be located within outer ring around template hole. Lights should turn off. IMPORTANT - TEST BULB MUST BE HELD FIRMLY IN POSITION ON TEMPLATE DURING TESTING AND ADJUSTING. TAPING IN POSITION MAY BE NECESSARY.

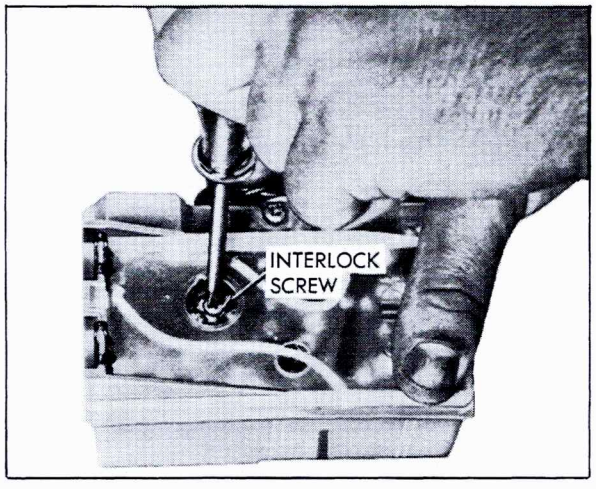


Fig. 15-47 Time Delay Interlock Screw

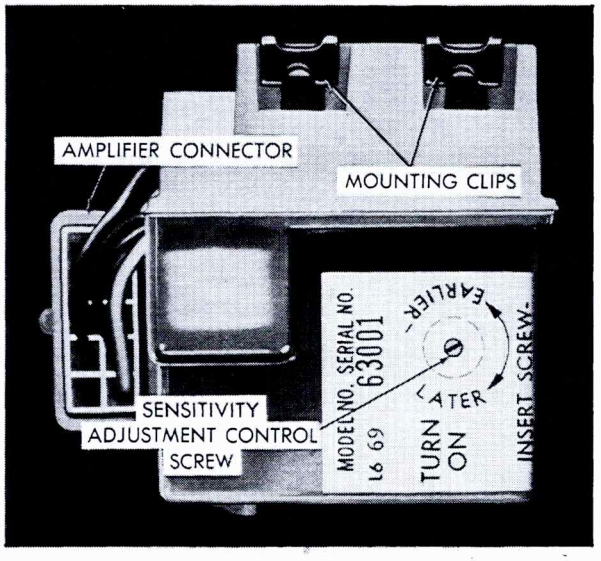


Fig. 15-48 Sensitivity Adjustment Control Screw

4. Rotate Analyzer voltage control counterclockwise until meter reads 5.5 volts. NOTE - At specific customer request it is permissible to adjust to 7.0 volts for earlier turn-on time or 4.0 for later turn-on time.

5. Still holding test bulb in position over template hole, slowly adjust amplifier sensitivity control counterclockwise just to point where headlamps turn on.

6. Check adjustment by rotating Analyzer voltage control clockwise to full scale meter reading. Headlamps should turn off. Now rotate control counterclockwise slowly just to point where headlamps turn on. At point of turn-on meter should read within ±.5 volts of voltage setting used in step 4, but should not exceed 7.0 volts. If OK, proceed to step 7. If not, repeat steps 2 through 5 to readjust.

7. Now slowly rotate Analyzer voltage control clockwise just to point where headlamps turn off. Voltmeter should read between .5 and 2.5 volts greater than turn-on voltage obtained in step 6. If reading is within tolerance, unit is OK. Tighten time delay interlock screw and reinstall amplifier. Recheck for turn off under daylight conditions by shining flashlight (standard 2-cell with batteries in good condition) on photocell through windshield after removing template. CAUTION: ALLOW FOR TIME DELAY RUN-OUT (10 to 60 seconds).

CAUTION: Be careful when tightening interlock screw so that threads in circuit board do not become stripped. If the threads should become stripped, the screw should be removed and a jumper strip soldered between the two solder islands.

8. If unit failed to adjust within specifications as shown in steps 6 and 7, perform the following steps to isolate failure to photocell or amplifier.

a. Connect voltage output lead (red single wire) to Analyzer voltage output socket, Fig. 15-49. Function selector switch must be rotated to position #1.

b. Connect black sleeved connector from Analyzer 13 VDC "in" lead to body ground, and connect voltage output lead to black wire in amplifier 10-way connector, Fig. 15-49. Turn amplifier sensitivity control completely clockwise. CAUTION: BE SURE CONNECTION IS MADE TO THE ALL BLACK WIRE AND NOT THE BLACK WITH YELLOW STRIPE WIRE.

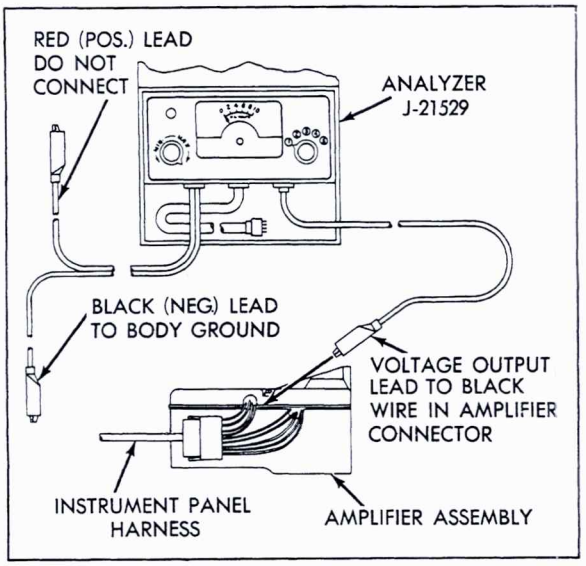


Fig. 15-49 Analyzing Component Failure

c. By alternately applying bright light (flashlight) to the photocell and then removing light and covering cell with hand, a wide swing of the voltmeter needle should be observed. If so, the photocell is OK and amplifier should be replaced. If not, replace defective photocell.

50. Control Switch

The procedure for removing and installing the Twilight Sentinel control switch is described in Section 12, Note 60.

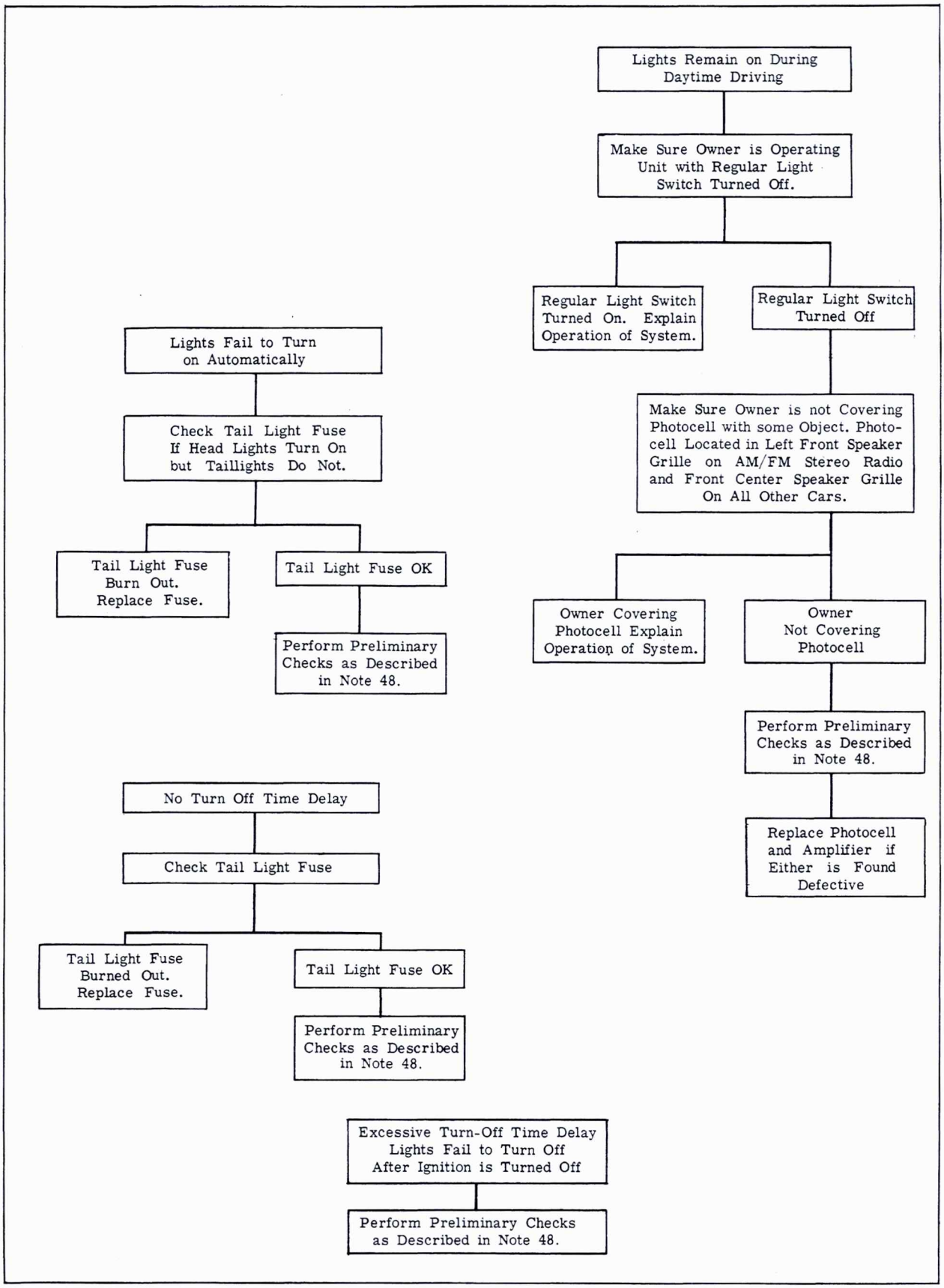
51. Photocell Unit

The procedure for removing and installing the Twilight Sentinel photocell unit is described in Section 12, Note 82.

52. Amplifier Unit

The procedure for removing and installing the Twilight Sentinel amplifier unit is described in Section 12, Note 83.

TWILIGHT SENTINEL TROUBLE DIAGNOSIS



GENERAL DESCRIPTION
REAR WINDOW DE-FOGGER

The Rear Window De-Fogger is available as either a factory or dealer installed accessory on all 1969 Cadillacs, except convertibles and 698 styles. A Rear Window De-Fogger is standard equipment on the 697 styles. The De-Fogger will help clear mist and fog from the rear window.

On all but 693 and 697 styles, air is drawn from under the rear seat into the De-Fogger blower located on the back of the rear seat. The blower then directs the air against the rear window through an outlet located on the rear parcel shelf.

On 693 styles, air from the passenger compartment is drawn through an inlet on the rear parcel shelf, and is then directed against the rear window through an outlet located on the shelf. On 693 styles, the blower motor is mounted on the underside of the rear parcel shelf.

The switch for controlling the Rear Window De-Fogger is located in the instrument panel bezel on all cars except 697 styles. When the switch is to the far left position, the De-Fogger is OFF. Moving the switch to the center provides LOW blower speed, and to the right, HIGH blower speed. The wiring diagram for the Rear Window De-Fogger is illustrated in Fig. 15-50.

53. Rear Window De-Fogger Checking Procedure

1. Perform blower motor test, Note 54.
2. If blower operates satisfactorily, perform blower switch test, Note 56.
3. Low and high speeds in the Rear Window De-Fogger are provided by a resistance type and ordinary wire in the wiring assembly, Fig. 15-50.

If blower motor and switch operate satisfactorily when tested, but the unit will not operate or will not give a variation between high and low speeds, the De-Fogger blower wire assembly is at fault. Repair or replace assembly is defective.

54. Blower Motor Test

1. If working on car, disconnect blower motor feed wire (yellow wire).
2. Using a 12-volt power source, connect the negative lead to blower motor housing and touch ground wire to housing if working off car. Connect

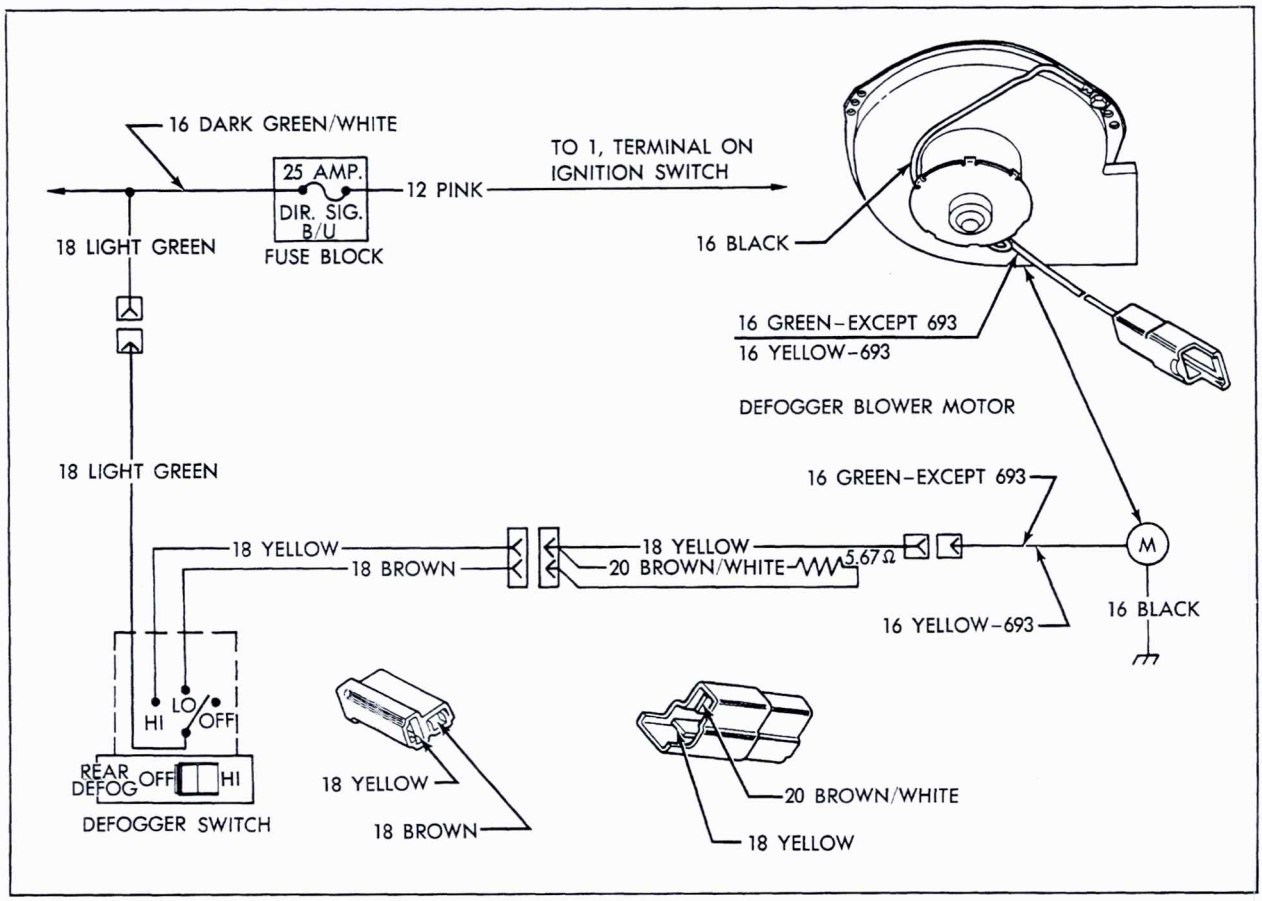


Fig. 15-50 Rear Window De-Fogger Diagram

the positive lead to the blower motor feed connection. If blower does not operate, replace as an assembly.

NOTE: If motor is operative but air is not fed from air outlet grille, check all hose connections and hoses for damage.

Check for obstructions at air inlet and outlet. The insulation between the cloth and metal package shelf should be slotted to provide air openings.

55. Rear Window De-Fogger Blower

a. Removal (All Except 693 and 697)

NOTE: Access to blower motor is gained through trunk compartment.

1. Disconnect yellow blower motor feed wire at blower motor.
2. Remove three screws securing blower motor to rear seat back panel and remove blower motor.

b. Installation (All Except 693 and 697)

1. Position blower motor on seat back panel and secure with three screws.
2. Connect yellow blower motor feed wire at blower motor.

c. Removal (693)

NOTE: Access to blower motor is gained through trunk compartment.

1. Disconnect yellow blower motor feed wire at blower motor.
2. Remove two clamps securing hoses to blower motor.
3. Remove two screws securing blower motor and remove motor.

d. Installation (693)

1. Position blower motor and secure with two screws.
2. Install two hoses at blower motor and secure with two clamps.
3. Connect yellow blower motor feed wire at blower motor.

56. Blower Switch Test

1. Remove instrument panel top cover as described in Section 12, Note 44a.
2. Turn ignition on but do not start engine. Disconnect accessories connector at fuse panel (light green wire). Touch one lead of a test lamp to ACC terminal on fuse panel and other to ground; lamp should light. If it does not, difficulty is in wiring to fuse panel or a blown fuse. If it does light, connect accessories connector at fuse panel and proceed as outlined below.
3. Check switch as follows:

a. Place switch lever in OFF position. Disconnect wiring connector leading from blower switch. Using connector with yellow and brown leads, touch one lead of lamp at yellow wire terminal and ground other lead. Then touch one lead at brown wire terminal and ground other lead. Lamp should not light in either instance.

b. Place switch lever in low speed position. Touch one lead at brown wire terminal and ground other lead. Lamp should light. Then touch one lead at yellow wire terminal and ground other lead. Lamp should not light.

c. Place switch lever in high speed position. Touch one lead at brown wire terminal and ground other lead. Lamp should light. Then touch one lead at yellow wire terminal and ground other lead. Lamp should light.

d. If no defect is found in switch, connect wiring connector and replace instrument panel top cover as described in Section 12, Note 44b.

4. If switch does not check as described above, replace as described in Section 12, Note 84.

57. Blower Switch Removal and Installation

The procedure for removing and installing the blower switch is described in Section 12, Note 84.

REAR WINDOW DE-FOGGER DIAGNOSIS CHART

CONDITION	CAUSE	REMEDY
De-fogger inoperative in any switch position.	Wiring to fuse block defective. Blower motor defective. Hose or hoses on 693 style damaged or disconnected. Defective blower switch. Blower wire assembly open between splice and blower.	Locate defective wiring and correct. Check as described in Note 54. Replace or connect. Check as described in Note 56. Repair or replace if other checks fail.
De-fogger inoperative in low speed position only.	Defective blower switch. Defective brown with white wire.	Check as described in Note 56. Repair or replace if above check fails.
De-fogger inoperative in high speed position only.	Defective blower switch. Yellow wire in de-fogger blower wire assembly defective before splice at brown with white wire.	Check as described in Note 56. Repair or replace if above check fails.
De-fogger operative with ignition ON and switch lever in OFF position.	Defective blower switch.	Check as described in Note 56.
De-fogger operates intermittently or varies in speed.	Loose ground wire connection at blower motor on all but 693 style. Frayed wiring.	Tighten connection. Locate and repair or replace.
No air flow with motor and wiring performing correctly.	Obstruction at air inlet or outlet.	Remove obstruction; check insulation between cloth and metal package shelf.

GENERAL DESCRIPTION

SEAT WARMERS

Seat Warmers are available as a factory-installed accessory on all 1969 Cadillac cars except the 698 style. The Seat Warmers are located in the front seats on all but 697 styles, which have Rear Seat Warmers.

Cloth heating pads with electrical resistance heating elements are located in the seat cushions and backs. The cloth material has a watt density of 22-30 watts per square foot, requiring an approximate 24-26 ampere current draw at 13-1/2 volts.

Seat Warmer

The system consits of an ON-OFF switch, thermal switch, relay, cloth heating pads, circuit breaker, fuse and wiring, Fig. 15-51. The ON-OFF switch is mounted on the instrument panel cluster bezel.

The relay is mounted on the right wheelhouse on 693 series, and on the heater assembly on non-air conditioned 682 cars. It is mounted on the evaporator blower assembly on all other series cars. The thermal switch is located in the heater water circuit between the water pump and heater core on the right wheelhouse.

Wiring protection is provided by a 6-amp fuse near the tell-tale light terminal (#4) on the voltage regulator, and a 25 amp circuit breaker mounted with the relay on the right front wheel dustshield.

With the engine running and the ON-OFF switch on, the pads may be turned off with the ON-OFF switch; or, if left on, the system will turn off

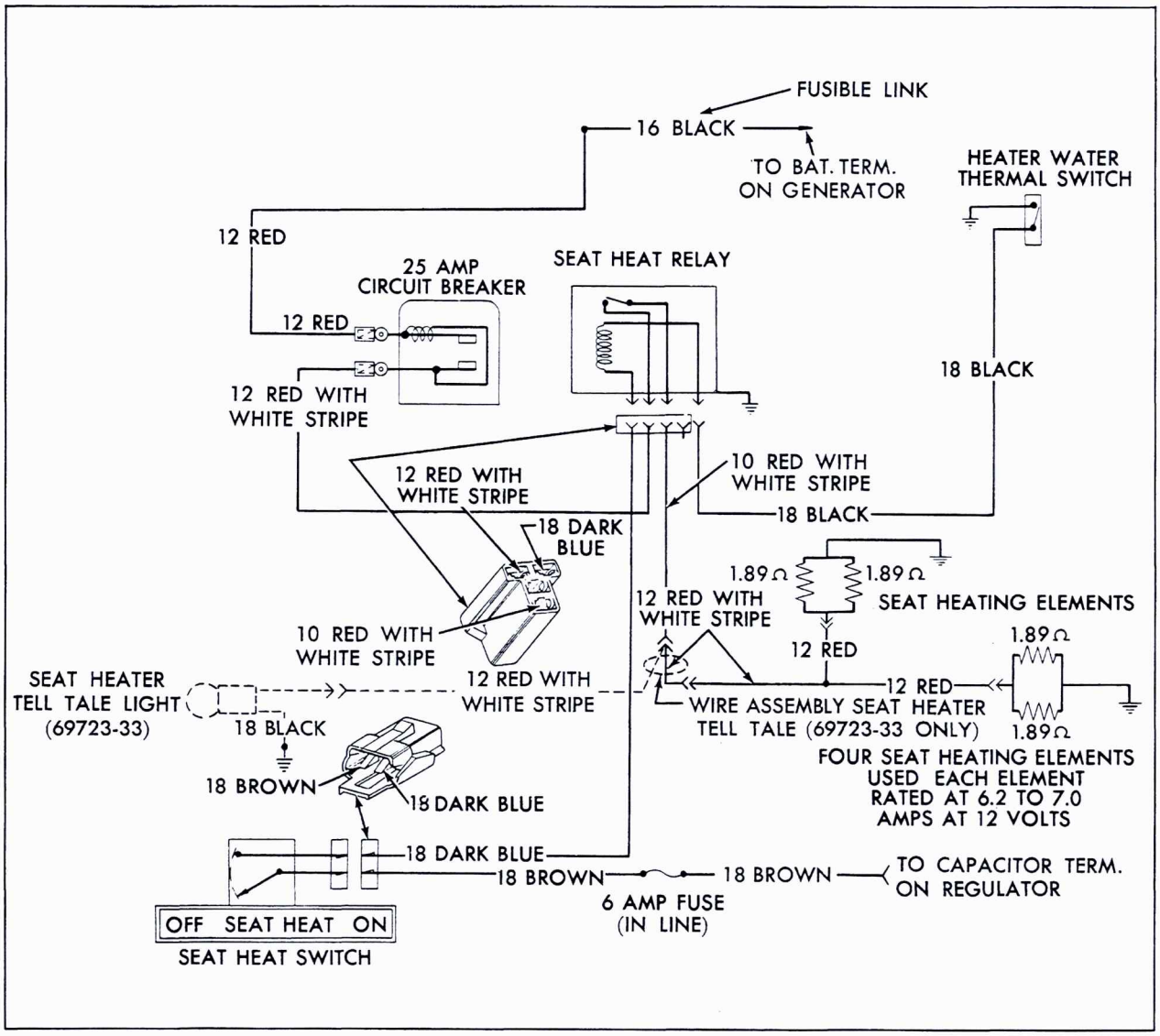


Fig. 15-51 Seat Warmer Circuit Diagram

automatically when the heater water temperature opens the thermal switch. If the thermal switch is open (warm engine), the system will not turn on with the use of the ON-OFF switch. In addition, the system operates only with the engine running. On rear Seat Warmers, a red indicator lamp, located on the steering column lower cover, will glow when the pads are warming.

Seat Warmer Operation

With the engine running and the ON-OFF switch on, control current flows from the tell-tale light terminal (#4) of the voltage regulator, through the 6-amp fuse and the ON-OFF switch, and on to the relay coil in the relay, through the thermal switch and to ground.

Current flows through the thermal switch only when the heater water temperature is less than approximately 150°F.

The seat warmers automatically turn off and remain off as soon as the car heater provides adequate heat. However, on cars equipped with Automatic Climate Control, the seat warmers will not automatically turn off with the Climate Control in the "VENT" position or the "OFF" position, or when the system is providing maximum cooling in any other position. In such case it is necessary to turn off the seat warmers with the manual switch.

The design of the control circuit is such that insufficient voltage is supplied for the relay coil to close the relay points except when the engine is running.

When the magnetic field in the relay coil closes the points, current flows from the battery terminal of the starter solenoid through the 25-amp circuit breaker, the relay points, and on to the seat pads.

58. Seat Warmer Component Testing

a. Quick Check

1. With engine off, use a self-powered test lamp to check continuity of thermal-switch-housing to ground.

2. Detach connector at thermal switch (black wire) and attach a jumper wire from thermal switch connector to ground, Fig. 15-52.

NOTE: A jumper wire with a male terminal on one end and an alligator clip on the other is best suited for this purpose.

3. Start engine and turn ON-OFF switch on.

4. After waiting one minute, all four heating pads should warm. On 697 styles, the red indicator lamp should glow.

5. Turn ON-OFF switch off and wait one minute. Pads should now be cooler.

6. If system operates as described above, the thermal switch should be tested as outlined in part (c) of this Note. If system passes quick check and thermal switch test, it is performing properly. If system does not pass quick check more extensive tests are outlined in part (b) of this note. On 697 styles, if system operates properly except indicator lamp does not glow, refer to part d of this note.

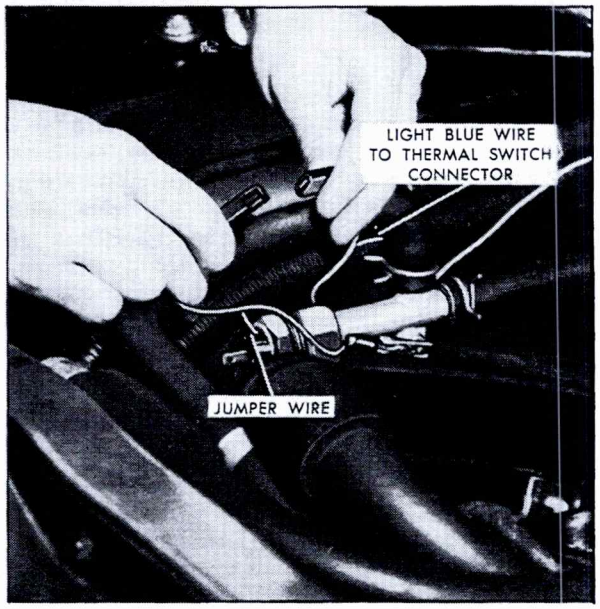


Fig. 15-52 Grounding Thermal Switch Connector

b. Seat Warmer Tests

NOTE: When performing these tests use a test lamp that is not self-powered except where the need of a self-powered test lamp is indicated.

1. With engine off, use a self-powered test lamp such as Diode Tester, J-21008, to check continuity of thermal switch to ground.

2. If proceeding from part (a) of this Note, disconnect jumper wire from thermal switch connector at ground. If not, detach connector at thermal switch (black wire) and attach jumper wire at thermal switch connector.

NOTE: A jumper wire with a male terminal on one end and an aligator clip on the other is best suited for these tests.

3. Start engine and turn ON-OFF switch on.

4. Touch ground end of jumper wire to a good ground. Relay should click. If it does, proceed to step 10. If not, proceed to step 5. Attach jumper wire to ground, Fig. 15-52.

5. Detach multiple connector from relay. Touch one lead of test lamp to connector terminal attached to dark blue wire, Fig. 15-53 and ground other lead. Lamp should light. If lamp lights but relay did not click in step 4, the relay or light blue wire to the thermal switch is defective and must be replaced. If lamp does not light, proceed to step 6.

6. Remove steering column lower cover as described in Section 12, Note 44a.

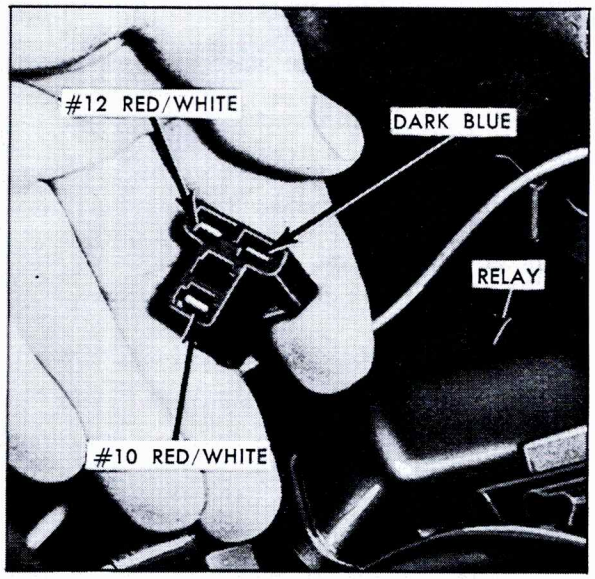


Fig. 15-53 Relay Multiple Connector

7. Disconnect ON-OFF switch connector. Touch one lead of a test lamp to connector terminal that has a brown wire leading to the voltage regulator and ground other lead. Lamp should light. If lamp lights, but did not light in step 5, ON-OFF switch or dark blue wire to relay is defective and must be replaced. If lamp does not light, proceed to step 8. Attach ON-OFF switch connector and make certain switch is in ON position.

8. Check for blown in-line 6-amp fuse in brown wire near voltage regulator terminal #4.

9. If circuit problem is still not isolated, perform further continuity checks in the remainder of the circuit to the positive battery terminal.

10. Touch one lead of test lamp to relay connector terminal attached to red wire, Fig. 15-53 and ground other lead. Lamp should light. If it does not, proceed to step 11.

11. If lamp did not light in step 10, remove protective cover from relay battery terminal. Mark terminal for installation purposes. Ground one lead of test lamp and touch other lead in turn to both circuit breaker mounting studs. If lamp lights at both terminals, red wire from circuit breaker to relay is defective; if lamp lights at one terminal but does not light at other, circuit breaker is defective; if lamp fails to light at either terminal, check red wire from circuit breaker to battery teminal of starter solenoid. Replace defective parts.

12. Turn ON-OFF switch off.

13. Disconnect straps and four wiring harness connectors beneath seat cushion.

14. Ground one lead of test lamp and touch other lead in turn to connector terminals that lead to relay. Lamp should not light. If it does, points in relay are stuck and relay must be replaced.

15. Turn ON-OFF switch on and repeat step 14. Lamp should light. If test lamp does not light at all terminals, wiring to relay or relay is defective and must be replaced. Also check harness connections at remaining two connectors beneath seat and at cowl. If one terminal connection makes the test lamp light, the defective wires must be repaired or replaced.

16. Using an ohmmeter, touch one lead in turn to each connector terminal that leads to heating pads and ground other lead. Ohmmeter should read approximately 1.89 ohms resistance at each connector. A very high reading indicates excessive resistance and a reading below one ohm indicates a short circuit. If one or more pads are defective, they must be replaced as described in Note 59.

17. If system operates as described above, the thermal switch should be tested as outlined in part c of this note.

c. Thermal Switch Test

1. Start engine and let it idle for five minutes. Turn off ignition.

2. Disconnect black wire at thermal switch (if not previously disconnected). Touch one lead of a self-powered test lamp to male connector and the other to base of switch, Fig. 15-54. Lamp should not light. If it does, replace switch.

3. Drain enough coolant from system to prevent coolant loss when top hose is removed. Remove top hose to thermal switch tee clamp and disconnect this hose. Pour a cup of cold water over tee, Fig. 15-55. Again touch one lead of self-powered test lamp to male connector and other to base of switch. Lamp should light. If lamp does not light, replace switch.

d. Indicator Lamp Service (697 Styles)

1. If red indicator lamp does not function on 697 styles, remove steering column lower cover as described in Section 12, Note 45a.

2. Check bulb and replace if necessary.

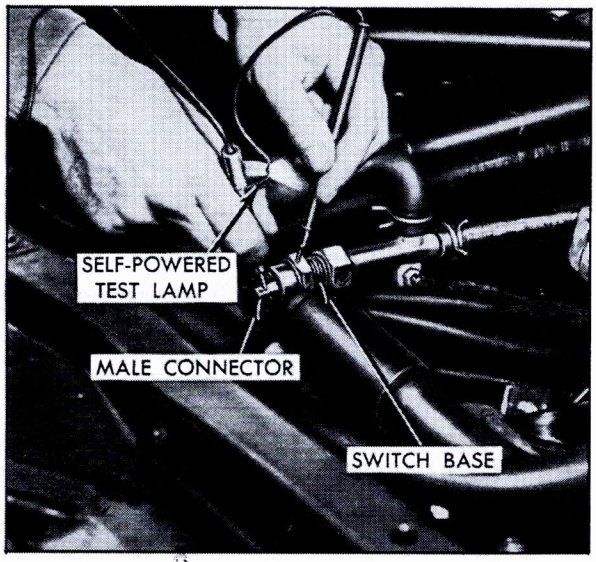


Fig. 15-54 Testing Thermal Switch

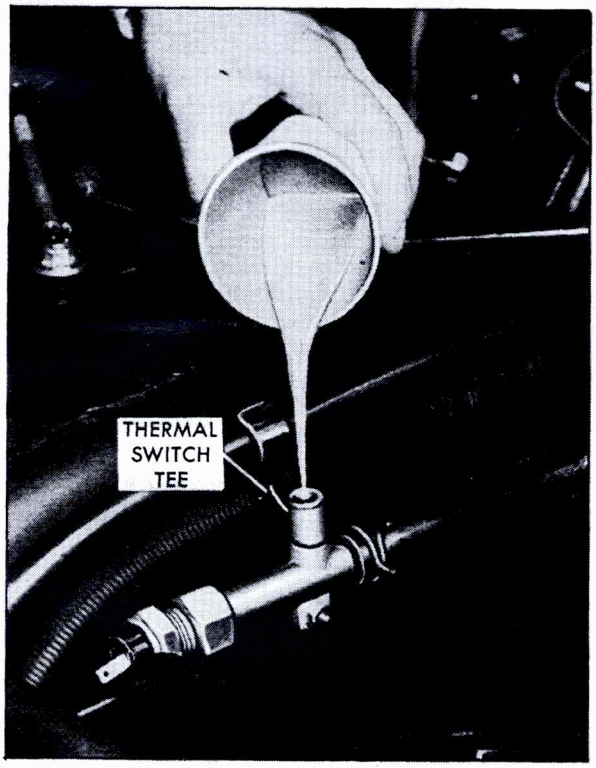


Fig. 15-55 Cooling Thermal Switch

3. Check condition of 18 black ground wire and repair or replace if necessary.

4. Check condition of other bulb lead and red with white stripe wire that attaches to this lead. Repair or replace if necessary.

5. Install steering column lower cover as described in Section 12, Note 45b. Check system as described in part a of this note.

59. Heating Pad

a. Removal

1. Disconnect four feed connectors to heating pads.

2. Remove seat trim cover and wiring. Heating pad is sewn into cover and is replaced with the trim cover.

b. Installation

1. Install wiring and new seat trim cover and sew into position.

2. Attach four feed connectors to heating pads. After any tests or work have been performed on the system, normal connections should be made and the Quick Check described in Note 58a should be performed again. If trouble was in the thermal switch, the Thermal Switch Test described in Note 58c should be repeated also.

DRILL SIZES

Letter Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches	Wire Gage Sizes	Drill Diam. Inches
Z	0.413	1	0.2280	28	0.1405	55	0.0520
Y	0.404	2	0.2210	29	0.1360	56	0.0465
X	0.397	3	0.2130	30	0.1285	57	0.0430
W	0.386	4	0.2090	31	0.1200	58	0.0420
V	0.377	5	0.2055	32	0.1160	59	0.0410
U	0.368	6	0.2040	33	0.1130	60	0.0400
T	0.358	7	0.2010	34	0.1110	61	0.0390
S	0.348	8	0.1990	35	0.1100	62	0.0380
R	0.339	9	0.1960	36	0.1065	63	0.0370
Q	0.332	10	0.1935	37	0.1040	64	0.0360
P	0.323	11	0.1910	38	0.1015	65	0.0350
O	0.316	12	0.1890	39	0.0995	66	0.0330
N	0.302	13	0.1850	40	0.0980	67	0.0320
M	0.295	14	0.1820	41	0.0960	68	0.0310
L	0.290	15	0.1800	42	0.0935	69	0.0292
K	0.281	16	0.1770	43	0.0890	70	0.0280
J	0.277	17	0.1730	44	0.0860	71	0.0260
I	0.272	18	0.1695	45	0.0820	72	0.0250
H	0.266	19	0.1660	46	0.0810	73	0.0240
G	0.261	20	0.1610	47	0.0785	74	0.0225
F	0.257	21	0.1590	48	0.0760	75	0.0210
E	0.250	22	0.1570	49	0.0730	76	0.0200
D	0.246	23	0.1540	50	0.0700	77	0.0180
C	0.242	24	0.1520	51	0.0670	78	0.0160
B	0.238	25	0.1495	52	0.0635	79	0.0145
A	0.234	26	0.1470	53	0.0595	80	0.0135
		27	0.1440	54	0.0550		

DECIMAL EQUIVALENTS

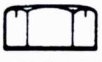
1/64	.015625	33/64	.515625
1/32	.03125	17/32	.53125
3/64	.046875	35/64	.546875
1/16	.0625	9/16	.5625
5/64	.078125	37/64	.578125
3/32	.09375	19/32	.59375
7/64	.109375	39/64	.609375
1/8	.125	5/8	.625
9/64	.140625	41/64	.640625
5/32	.15625	21/32	.65625
11/64	.171875	43/64	.671875
3/16	.1875	11/16	.6875
13/64	.203125	45/64	.703125
7/32	.21875	23/32	.71875
15/64	.234375	47/64	.734375
1/4	.25	3/4	.75
17/64	.265625	49/64	.765625
9/32	.28125	25/32	.78125
19/64	.296875	51/64	.796875
5/16	.3125	13/16	.8125
21/64	.328125	53/64	.828125
11/32	.34375	27/32	.84375
23/64	.359375	55/64	.859375
3/8	.375	7/8	.875
25/64	.390625	57/64	.890625
13/32	.40625	29/32	.90625
27/64	.421875	59/64	.921875
7/16	.4375	15/16	.9375
29/64	.453125	61/64	.953125
15/32	.46875	31/32	.96875
31/64	.484375	63/64	.984375
1/2	.5	1	

BOLT AND NUT IDENTIFICATION

BOLT STEEL CLASSIFICATION

G. M. MATERIAL NO.	HEAD MARKING	STRENGTH
260-M	 (None)	Standard
280-M	 (120°)	Medium
300-M	 (60°)	High

HEX-NUT STEEL CLASSIFICATION

G. M. MATERIAL NO.	MARKING	STRENGTH
Conventional Type		
286-M	  (None)	Standard
301-M	  USUAL (120°)	High
	  OPTIONAL (120°)	
Prevailing Lock Type (Stover)		
A	 (None)	Standard
B	 (120°)	Medium
C	 (60°)	High

WEIGHTS AND MEASURES

LINEAR MEASURE

1/12 foot (ft.) ..... = 1 inch (in.)
12 inches ..... = 1 foot
3 feet ..... = 1 yard (1 yd.)

AREA MEASURE

1/144 square foot (sq. ft.) .. = 1 square inch (sq. in.)
144 square inches ..... = 1 square foot
9 square feet ..... = 1 square yard (sq. yd.)

LIQUID MEASURE

1/16 pint (pt.) ..... = 1 ounce (oz.)
1 pint ..... = 16 ounces
2 pints ..... = 1 quart (qt.) = 32 ounces
4 quarts ..... = 1 gallon (gal.)
31 1/2 gallons ..... = 1 barrel (bbl.)

DRY MEASURE

1/2 quart (qt.) ..... = 1 pint (pt.)
2 pints ..... = 1 quart (qt.)
8 quarts ..... = 1 peck (pk.)
4 pecks ..... = 1 bushel (bu.)
105 quarts ..... = 1 barrel

CUBIC MEASURE

1,728 cubic inches ..... = 1 cubic foot
27 cubic feet ..... = 1 cubic yard

COMMON WEIGHT

16 ounces ..... = 1 pound
100 pounds ..... = 1 hundred weight (cwt.)
2000 pounds ..... = 1 ton

COMMON U.S.A. EQUIVALENTS

LENGTH

1 inch ..... = 25.4001 millimeters
1 millimeter ..... = 0.03937 inches
1 foot ..... = 0.304801 meters
1 meter ..... = 3.28083 feet
1 yard ..... = 0.914402 meters
1 meter ..... = 1.093611 yards
1 mile ..... = 1.609347 kilometers
1 kilometer ..... = 0.621370 miles

LIQUID CAPACITY

1 quart ..... = 0.94633 liters
1 liter ..... = 1.05671 quarts
1 gallon ..... = 3.78533 liters
1 liter ..... = 0.26418 gallons

DRY CAPACITY

1 quart ..... = 1.1012 liters
1 liter ..... = 0.9081 quarts
1 peck ..... = 8.810 liters
1 liter ..... = 0.11351 pecks

INDEX

B

C

D

E

F

G

H

I

K